Land Use Report Phase I.

south central planning and development commission

May 1980

P.O. BOX 846 THIBODAUX, LOUISIANA 70301

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LAND USE REPORT: PHASE I

For The

SOUTH CENTRAL PLANNING AND DEVELOPMENT DISTRICT

Prepared By

SOUTH CENTRAL PLANNING & DEVELOPMENT COMMISSION

THIBODAUX, LOUISIANA

THIS REPORT WAS PREPARED UNDER CONTRACT CPA-LA-06-48-1090 BY SOUTH CENTRAL PLANNING & DEVELOPMENT COMMISSION. THE PREPARATION OF THIS REPORT WAS FINANCIALLY AIDED THROUGH A COMPREHENSIVE PLANNING GRANT FROM THE DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND THROUGH THE ASSISTANCE OF THE STATE OF LOUISIANA, DEPARTMENT OF URBAN AND COMMUNITY AFFAIRS, AND BY SOUTH CENTRAL PLANNING & DEVELOPMENT COMMISSION.

MAY 1980

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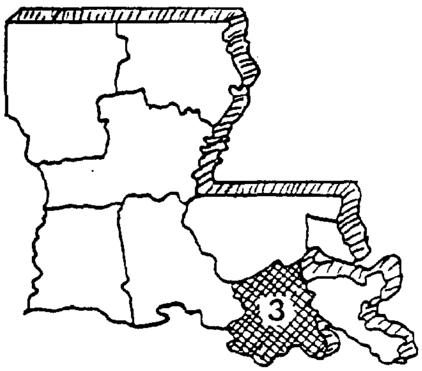
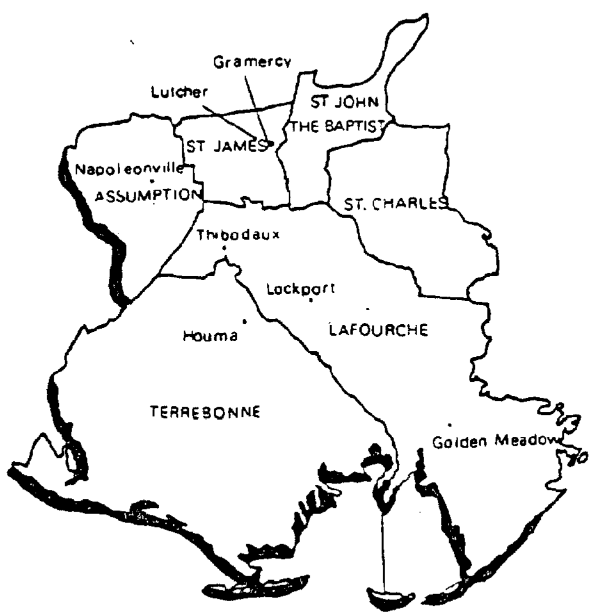


CITY LOCATIONS IN THE DISTRICT



INTRODUCTION

The production of this series of reports under the HUD 701 Program has been needed in our area for quite some time. Numerous documents, research papers, books, maps, etc., exist providing detailed descriptions of the physical components of the South Central Area. However, there is currently no one source available to present a complete overview of the region without becoming embroiled in the minute details of the physical parameters discussed in this document. This report is therefore an attempt to collect and present such data in a single document for use by the many clients served by South Central Planning.

The Report Series is divided into three phases:

(1980-81) 1. Description of Land Cover (Geology, Climate, etc./ Land Use) in the South Central Region

(1981-82) 2. Comparison of Land Use Changes from the 1973 Land Use and Data Analysis (LUDA) land use study to the 1980 Land Areal Resource Information System (LARIS) land classification

(1982-83) 3. Project Future Land Uses and Policies to deal with anticipated changes

The phasing of this report was necessary due to the limited financial resources of the agency, the unavailability of essential land use data this year, and the lack of personnel to do the work.

1980-81 REPORT: DESCRIPTION OF LAND COVER

The body of this year's report is divided into two sections.

Part I - The Natural Setting:

Chapter 1 - Climate
Chapter 2 - Geology
Chapter 3 - Geomorphology
Chapter 4 - Soils
Chapter 5 - Vegetation
Chapter 6 - Drainage and Groundwater
Chapter 7 - The Wetlands Ecosystem

Part II - Land Use:

Chapter 1 - Population/Settlement Patterns
Chapter 2 - Agriculture
Chapter 3 - Industrial Land Uses
Chapter 4 - Conflicts in Land Use

The above topics cover the main parameters of importance within our region regarding land use. Special chapters on the Wetlands Ecosystem and the Oil and Gas Industry were also added, due to the tremendous importance these areas have for the region as well as the entire country.

CONCLUSION

We feel that the elements included in this year's report will provide several important services to the user.

1. Provide a general information base about the region.
2. Provide a bibliographical source list if more detailed information is needed by the user.
3. Fill a gap in information availability for our agency.
4. Serve as a base for the many grant applications and requests that utilize this kind of data.

5. Provide a resource document for local officials to use in the planning process.

Although this report uses technical terms and descriptions, we have attempted to compromise the two considerations of easy readability and technical information so as to reach the greatest range of people with the information contained herein.

Finally, we intend to update this and subsequent reports to keep the information current and usable to all who request it. This report will be made available to local governmental entities for their use. We hope that you, the reader, find this document interesting, informative, and capable of meeting your planning needs.

Director of Planning

PART I

THE NATURAL SETTING

CHAPTER 1 - CLIMATE

By

Edwin J. Durabb

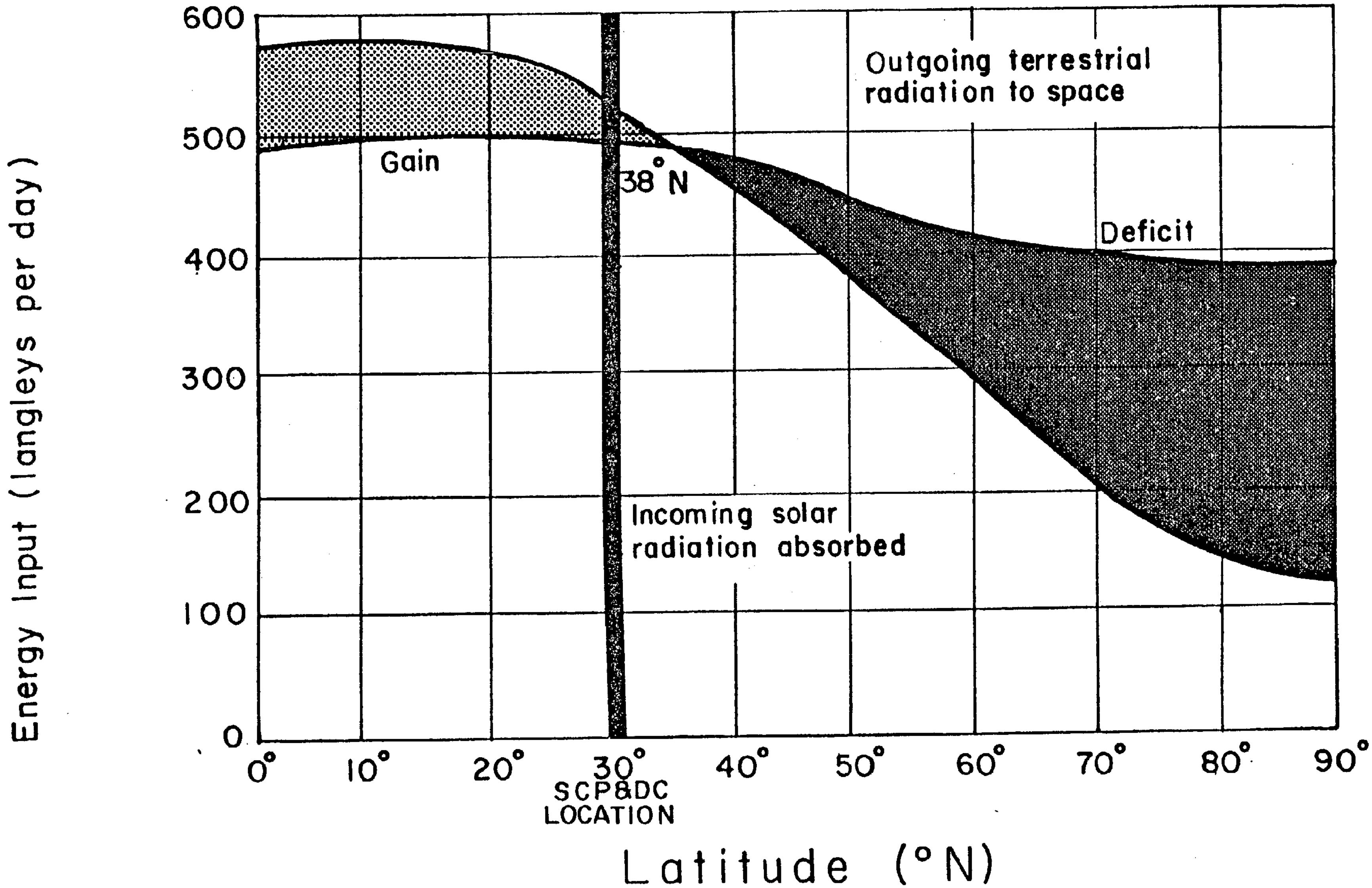
INTRODUCTION

The climate of the South Central District has been categorized by the Koppen-Geiger system of climatic classification as a "Cfa" type climate, i.e. warm and moist with a warm summer (Muller and Oberlander, 1978). One reason for the moisture and heat that dominates our climate is the Gulf of Mexico. This body of water provides the heat and moisture supply for the entire eastern half of the United States for significant portions of the year. The land area of our planning district sits immediately adjacent to this moisture source. Water temperatures in the Gulf, off the Louisiana coast, range from a low of $64^{O}F$ in February to $84^{O}F$ in July (U.S. Department of Commerce, 1979). This accounts for the moderating influence of Gulf air in the winter and hot, humid air in the summer.

Another main factor in our climate is our subtropical latitude. Although the geomorphology and climatic patterns of the United States and Canada allow colder continental air to intrude into the region on occasion, our subtropical latitude moderates the effect of these incursions in the winter. We receive high levels of solar radiation and actually receive more solar radiation than we lose to space for nearly eleven months out of the year (see Figure 1.1). Thus, the main components that shape our climate are latitude and proximity to the Gulf of Mexico. The following is a brief summary description of the parameters that make up the climate of the South Central Region.

FIGURE 1.1

SOLAR RADIATION BUDGET



SOURCE : Muller & Oberlander 1979 : pg 71

TEMPERATURE

Yearly average temperatures for the region reflect the subtropical latitude of the area, (see Figure 1.2). The area is categorized by long, hot summers and short, cool spring, fall and winter periods. Temperatures are uniformly hot with a high humidity in the summers. Highest temperatures generally occur in the inland areas. Spring, fall and winter generally consist of moderately warm humid periods dominated by tropical Gulf air, broken occasionally by Pacific or Polar continental drier-cooler air masses. The polar air incursions occur most often in the winter and can bring large sudden drops in temperature. In the winter, as in the summer, the coldest local temperatures occur inland and away from wetlands and water bodies. Extreme temperatures for the district range from 11^{O}F at Carville in the north in January, to 102^{O}F at the same station in August. (See Table 1.1, 1.2, 1.3 for detailed temperature observations from three selected stations.[1])

The growing season in the southern part of Louisiana is extremely long averaging over three-hundred days in the northern part of the district and nearly three-hundred, sixty-five days near the coast.

Occasionally, an early frost or freeze can damage the agricultural interests in the district since the main crop of sugarcane is a tropical plant susceptible to freeze damage. However, the average number of days when the minimum temperature drops below 32^{O}F is only seventeen at Carville, fifteen at Houma, and thirteen at New Orleans. Rarely do temperatures drop below 20^{O}F anywhere in the district.

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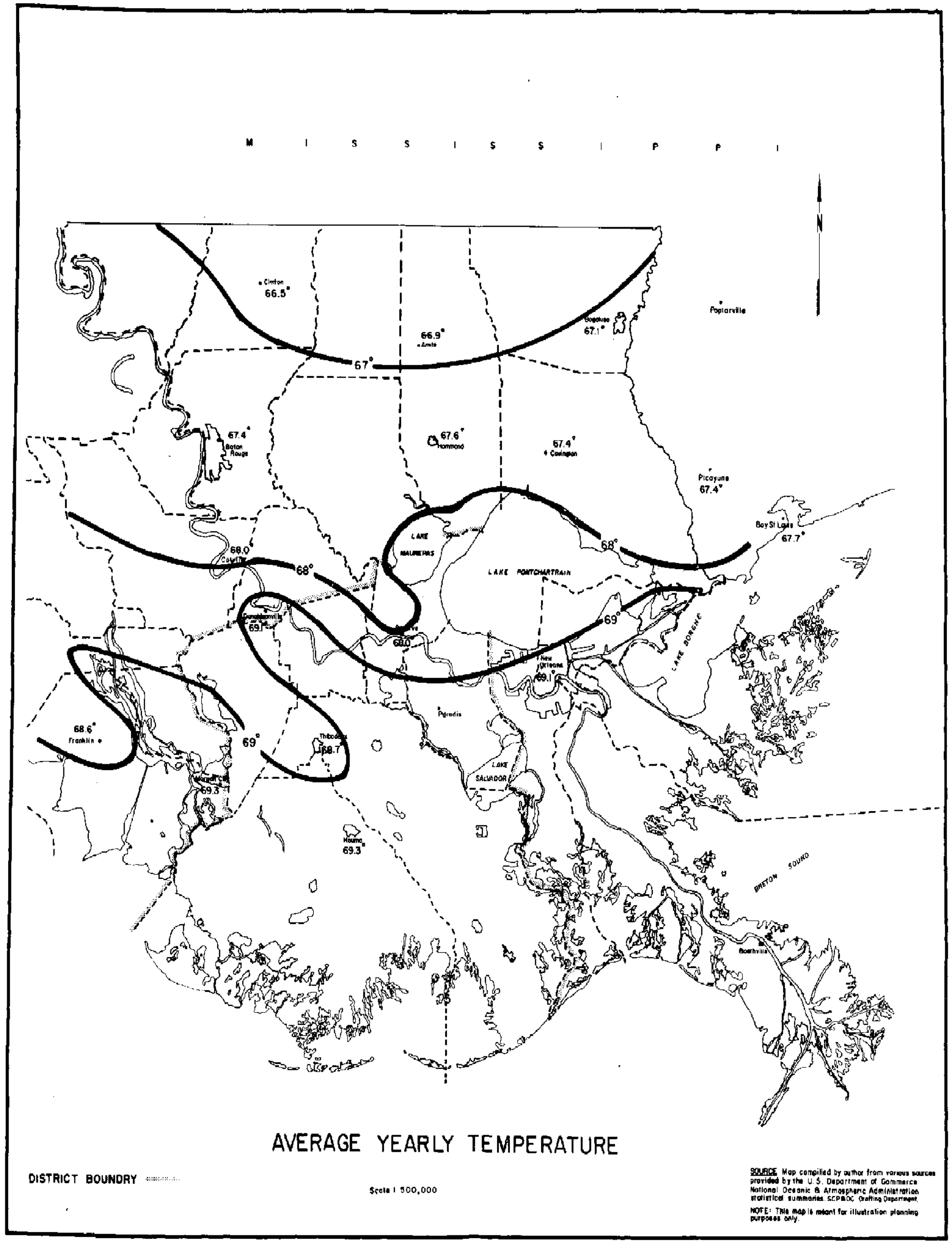
[1] Note that there are no recording weather stations in the northern part of our district. Therefore, we have chosen the closest station available outside of the district boundary which is Carville, Louisiana.

FIGURE 1.2


M I S S I S S I P P I
N
Clinton
66.5°
66.9°
Amite
Bogalusa
67.1°
Poplarville
67°
67.4°
Baton Rouge
67.6°
Hammond
67.4°
Covington
Picayune
67.4°
Bay St Louis
67.7°
LAKE MAUREPAS
LAKE PONTCHARTRAIN
LAKE BORGNE
68.0°
68°
69°
68.0
Donaldsonville
69.1°
New Orleans
69.1°
68.6°
Franklin
69°
Thibodaux
68.7
69.3°
Paradis
LAKE SALVADOR
Houma
69.3°
BRETON SOUND
Boothville
AVERAGE YEARLY TEMPERATURE
DISTRICT BOUNDRY
Scale 1:500,000
SOURCE Map compiled by author from various sources provided by the U.S. Department of Commerce National Oceanic & Atmospheric Administration statistical summaries. SCP&DC Drafting Department.
NOTE: This map is meant for illustration planning purposes only.

There are several factors that periodically effect the local climate picture. These are:

1. Proximity to the Gulf of Mexico.
2. Proximity to wetland areas and inland waters.
3. Proximity to the Mississippi River.
4. Urban influences.

Proximity to the Gulf of Mexico

Proximity to the Gulf of Mexico accounts for a significant increase in yearly temperature. More importantly, the impact of occasional surges of cold polar continental air is moderated by both wetlands and the Gulf itself thus altering temperatures. Water stores large quantities of heat and releases it slowly over time. This accounts for the fact that water takes longer to warm up and cool down in relation to the land surface. This fact causes a reduction in the temperature range over water and the adjacent land masses. This is reflected in the fact that Black Mangrove, a tropical type plant intolerant to freezes or even frost, is found immediately along the coast. Although there are no reporting weather stations on the coast in our district, the existence of Black Mangrove suggests a more moderate climate than in the interior where temperature occasionally drops below 32°F in the winter.

Proximity to Wetland Areas and Inland Waters

Temperature differences between water and land account for the sea and land breezes that moderate temperatures along the coast. Louisiana, with its vast inland marshes, swamps, bays and lakes, allows this moderating effect of water to extend far inland. Sea and land breezes can occur along lakes, for example, Lake Pontchartrain in the north of the region, and the water moderates temperatures wherever it is located. Since eighty-two percent of our district has water cover for most of the year, the influence in climate is significant (South Central Planning & Development Commission: 1976:1.)

Proximity to the Mississippi River

Since the Mississippi River is a large volume stream, local temperature irregularities are sometimes felt due to temperature differences between the water and the land. Whereas the Gulf of Mexico and local lakes are usually warm, the river water is cold, especially in the spring, causing localized fog and colder temperatures near to the channel.

Urban Influences

The predominantly rural South Central Planning and Development District only has three significant areas of man-made influences that alter temperatures. The cities of Thibodaux and Houma are large enough to generate heat and change the local micro-climate. The large industrial complexes along the River also produce enough heat to locally raise temperatures significantly.

The following tables (Table 1.1, 1.2, 1.3) list climate summaries for three communities that possess complete data collection capacity in or near our region. (Refer to Figure 1.2 for an overview of district temperature differences.)

TABLE 1.1

MORGAN CITY
1951-1973

LAT 29° 41' N
LONG 91° 11' W

	TEMPERATURE (°F)									PRECIPITATION TOTALS (inches)					
	Means			Extremes						Mean	Greatest Monthly	Year	Snow, Sleet		
Month	Maximum	Minimum	Monthly	Record High	Year	Day	Record Low	Year	Day				Mean	Maximum Monthly	Year
Jan.	64.3	43.6	53.9	84	1957	31st	12	1962	11th	4.14	10.64	1966	.0	.0	
Feb.	66.6	45.5	56.1	86+	1957	5th	17	1951	3rd	4.89	11.22	1966	.1	1.5	1958
March	72.2	51.4	61.8	88	1955	16th	28+	1968	1st	3.61	9.41	1973	.0	.0	
April	80.0	59.5	69.8	92	1955	30th	39	1953	19th	4.53	15.30	1973	.0	.0	
May	85.7	65.3	75.5	96	1953	28th	45	1960	13th	4.46	10.30	1969	.0	.0	
June	90.6	70.9	80.8	101	1954	30th	55	1956	3rd	4.99	15.82	1963	.0	.0	
July	91.8	72.9	82.4	99	1973	21st	60	1970	4th	7.90	20.34	1964	.0	.0	
Aug.	91.6	72.5	82.1	100	1962	12th	56	1956	23rd	6.65	10.05	1960	.0	.0	
Sept.	88.9	69.4	79.2	99	1970	13th	46	1967	30th	6.64	18.00	1973	.0	.0	
Oct.	82.0	59.3	70.7	94	1954	4th	34	1952	30th	3.98	9.75	1959	.0	.0	
Nov.	72.6	50.2	61.4	91	1973	5th	28+	1959	18th	3.61	11.65	1963	.0	.0	
Dec.	66.7	45.5	56.2	84	1951	7th	12	1962	13th	5.44	11.80	1963	.0	.0	
YEAR	79.4	58.8	69.2	101	1954	June 30th	12+	1962	Dec. 13th	60.84	20.34	July 1964	.1	.0	

+ Also recorded on earlier dates.

SOURCE: U.S. Department of Commerce, 1975.

Morgan City Supplemental Data

Mean Number of days Maximum 90° and above: 94 days
Mean Number of days Minimum 32° and below: 12 days
Greatest Daily Precipitation: 7.17" - June 17, 1963

TABLE 1.2

HOUMA
1951-1973
Elevation 15 feet

LAT 29° 35' N
LONG 90° 44' W

	TEMPERATURE (°F)									PRECIPITATION TOTALS (inches)					
	Means			Extremes						Mean	Greatest Monthly	Year	Snow, Sleet		
Month	Maximum	Minimum	Monthly	Record High	Year	Day	Record Low	Year	Day				Mean	Maximum Monthly	Year
Jan.	65.0	44.5	54.8	83	1952	2nd	12	1962	11th	4.58	12.36	1966	.0	.0	
Feb.	67.3	46.3	56.8	85	1957	4th	13	1951	3rd	4.86	10.28	1966	.1	2.5	1958
March	72.7	52.0	62.4	88	1965	25th	28+	1968	1st	4.13	9.50	1973	.0	.0	
April	79.8	59.6	69.7	90+	1965	13th	34	1971	8th	4.37	14.06	1973	.0	.0	
May	85.3	65.1	75.3	96	1953	28th	44	1952	12th	4.78	15.44	1959	.0	.0	
June	90.1	70.3	80.2	99	1954	30th	55	1966	2nd	6.45	14.08	1963	.0	.0	
July	90.9	72.5	81.7	99	1960	22nd	59	1967	16th	8.09	18.85	1954	.0	.0	
Aug.	90.7	72.2	81.5	100	1951	15th	60	1967	12th	6.51	10.55	1960	.0	.0	
Sept.	87.7	69.2	78.5	98	1964	1st	44	1967	30th	8.05	19.41	1973	.0	.0	
Oct.	81.5	58.6	70.0	94	1962	9th	31	1952	30th	3.10	11.60	1959	.0	.0	
Nov.	72.8	50.5	61.7	87+	1956	2nd	25	1951	18th	3.20	13.26	1963	.0	.0	
Dec.	67.5	46.2	56.9	84+	1956	7th	15	1962	13th	5.17	11.56	1967	.0	.0	
YEAR	79.3	58.9	69.1	100	Aug. 1951	12th	12	Jan. 1962	11th	63.59	19.41	Sept 1973	.1	.0	

+ Also on earlier dates

SOURCE: U.S. Department of Commerce, 1975.

Houma Supplemental Data

Mean Number of days Maximum 90° and above: 83 days
Mean Number of days Minimum 32° and below: 15 days
Greatest Daily Precipitation: 11.35" - May 31, 1959

TABLE 1.3

CARVILLE 2 SW
1951-1973
Elevation 26 feet

LAT 30° 12' N
LONG 91° 07' W

	TEMPERATURE (°F)									PRECIPITATION TOTALS (inches)					
	Means			Extremes						Mean	Greatest Monthly	Year	Snow, Sleet		
Month	Maximum	Minimum	Monthly	Record High	Year	Day	Record Low	Year	Day				Mean	Maximum Monthly	Year
Jan	63.1	41.6	52.3	82	1957	31st	11	1962	11th	4.30	10.65	1966	less than .1	1.0	1973
Feb.	65.7	43.5	54.6	84	1957	4th	13	1951	2nd	5.39	14.36	1966	.1	2.0	1973
March	71.9	49.2	60.6	88	1967	15th	24	1968	1st	4.20	9.32	1972	.0	.0	
April	79.5	57.2	68.4	91	1955	30th	35	1971	8th	4.32	11.22	1969	.0	.0	
May	85.7	63.9	74.8	96+	1953	28th	43	1970	4th	4.96	11.21	1959	.0	.0	
June	90.9	69.8	80.3	100	1954	30th	55	1952	1st	4.13	10.91	1957	.0	.0	
July	91.7	72.3	82.0	100	1960	22nd	58	1967	15th	6.70	12.52	1959	.0	.0	
Aug.	91.5	71.8	81.7	102	1962	10th	60	1956	23rd	5.61	11.24	1960	.0	.0	
Sept.	88.4	68.4	78.4	97+	1963	4th	45	1967	30th	5.28	15.58	1973	.0	.0	
Oct.	81.1	58.0	69.6	93+	1962	13th	34	1957	28th	2.66	9.51	1964	.0	.0	
Nov.	71.2	49.0	60.2	87	1971	2nd	25+	1970	24th	3.86	8.36	1957	.0	.0	
Dec.	65.1	44.1	54.6	82	1971	31st	13	1962	13th	6.22	14.48	1971	.0	.0	
YEAR	73.8	57.4	68.1	102	Aug. 1962	10th	11	Jan. 1962	11th	57.63	15.58	Sept. 1973	.1	.0	

SOURCE: U.S. Department of Commerce, 1975.

+ Also recorded on earlier dates.

Carville Supplemental Data

Mean Number of days Maximum 90° and above: 90 days
Mean Number of days Minimum 32° and below: 17 days
Greatest Daily Precipitation: 5.85" - December 10, 1961

PRECIPITATION

Precipitation in the district is heavy throughout the year. There are, however, two wet periods and one drier season. The two wet seasons occur in July-August, and December, respectively.

The drier period extends from late September to mid-November (U.S. Department of Commerce, 1979). Rainfall in the summer is usually associated with tropical air mass afternoon convection thunderstorms. Precipitation is heavy but of short duration. Rainfall in the winter is usually associated with cold frontal passages and, occasionally, low-pressure areas in the Gulf of Mexico. This rainfall is moderate and more widespread in nature. Sometimes heavy rains are associated with tropical waves or storms in the late summer and fall.

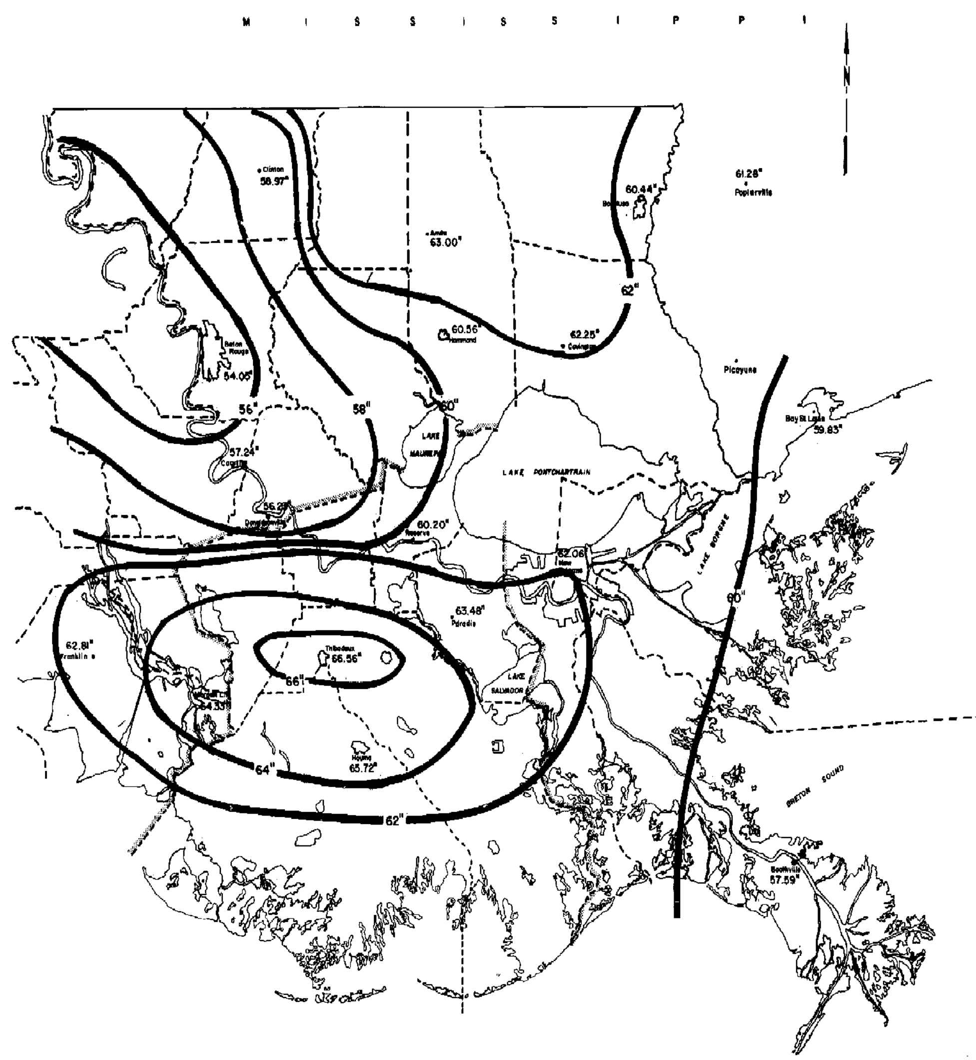
From 1954-1976, nine tropical storms or hurricanes passed through or near enough to the district to effect local precipitation (U.S. Department of Interior, 1977).

Snow and sleet are extremely rare inland and almost non-existent along the coast. For example, measurable snow has occurred only once in Houma during the period of 1951-73 and twice in Carville, Louisiana.

Figure 1.3 illustrates that maximum yearly precipitation occurs somewhat inland from the coast line. This is probably due to the warming effect of the land as moist ocean air passes over it. The large expanse of coastal marsh make the transition from a water to land base extremely slow.

Relative humidity, the component of the local climate that makes our weather most uncomfortable, is high throughout the year. Table 1.4 illustrates the yearly means of Relative Humidity for New Orleans. The driest and wettest monthly averages are also included.

FIGURE 1.3



AVERAGE YEARLY PRECIPITATION

DISTRICT BOUNDRY

Scale 1 : 500,000

SOURCE: Map compiled by author from various sources provided by the U. S. Department of Commerce National Oceanic & Atmospheric Administration statistical summaries. SCP&DC Drafting Department.

NOTE: This map is meant for illustation planning purposes only.

TABLE 1.4

AVERAGE RELATIVE HUMIDITY

NEW ORLEANS, LOUISIANA

	Midnight	6:00 A.M.	Noon	6:00 P.M.
(Dry) March	83 %	85 %	61 %	65 %
(Dry) November	84 %	86 %	60 %	74 %
(Wet) July	89 %	91 %	66 %	73 %
YEARLY AVERAGE	85 %	88 %	63 %	71 %

SOURCE: U. S. Department of Commerce, 1979.

WINDS

Prevailing winds generally blow from a southerly direction for about half the year. In the late fall, winter and early spring, intrusions of continental air into the region cause the resulting direction to shift primarily to a northeast or northerly component.

Winds are generally light in the summer with maximum speeds associated with the brief localized down drafts of afternoon thunderstorms. Winds can occasionally be much stronger in the late summer and fall due to tropical storm or hurricane activity. For example, along the coast at Grand Isle, estimated peak winds during Hurricane Betsy exceeded 120 MPH. This extreme wind is rare and always localized to coastal regions. In the winter, strong southerly winds or northerly winds associated with low pressure systems and high pressure centers blow for brief periods. Wind velocities are generally higher in the winter. At New Orleans[2], average wind speed ranges from 6.1 MPH in August to 10.3 MPH in March. The average being 8.4 MPH (U. S. Department of Commerce, 1979).

[2]New Orleans was the closest available station with wind data. There are no stations within the SCP&DC district that keep this type of record.

AIR QUALITY

Due to the recently developed heavy industries associated with the petro-chemical industry in the South Central District, and in response to the National Clean Air Act, Louisiana has established an air quality monitoring and control program. Table 1.5 lists the air quality monitoring stations in and near the South Central Region. Table 1.6 lists the air quality standards currently being used in Louisiana to monitor pollutants. Figures 1.7, 1.8 and 1.9 represent air quality monitor records (for five selected status) for the year 1978 to provide a reference point to determine the air quality in the SCP&DC district.

TABLE 1.5

AIR QUALITY MONITORING SITES

CITY	SITE NAME	ADDRESS	PARISH
Carville	USPHA Hospital	Highway 75	Iberville
Donaldsonville	Riverdale Subdivision	Highway 18	Ascension
Garyville	Mobile Trailer Lot	Azaleas, Apricot St.	St. John
Geismar	Wintz Mart Market	Highway 75	Ascension
Harvey	West Jefferson P.H.U.	1901 8th St.	Jefferson
Metairie	Borden Company	1751 Airline Hwy.	Jefferson
Metairie	East Jefferson P.H.U.	111 N. Causeway Blvd.	Jefferson

SOURCE: Louisiana Air Control Commission, 1978: p. 3, 4.

MONITORING PARAMETERS

	Continuous		Non-Continuous		
	O_3	SO_2	TSP	SO_2	NO_2
Carville	X		X	X	X
Garyville	X		X	X	X
Geismar			X	X	X
Harvey			X	X	X
Metairie					
Donaldsonville					

O_2 = Ozone

SO_2 = Sulphur Dioxide

NO_2 = Nitrogen Dioxide

TSP = Total Suspended Particulates

TABLE 1.6

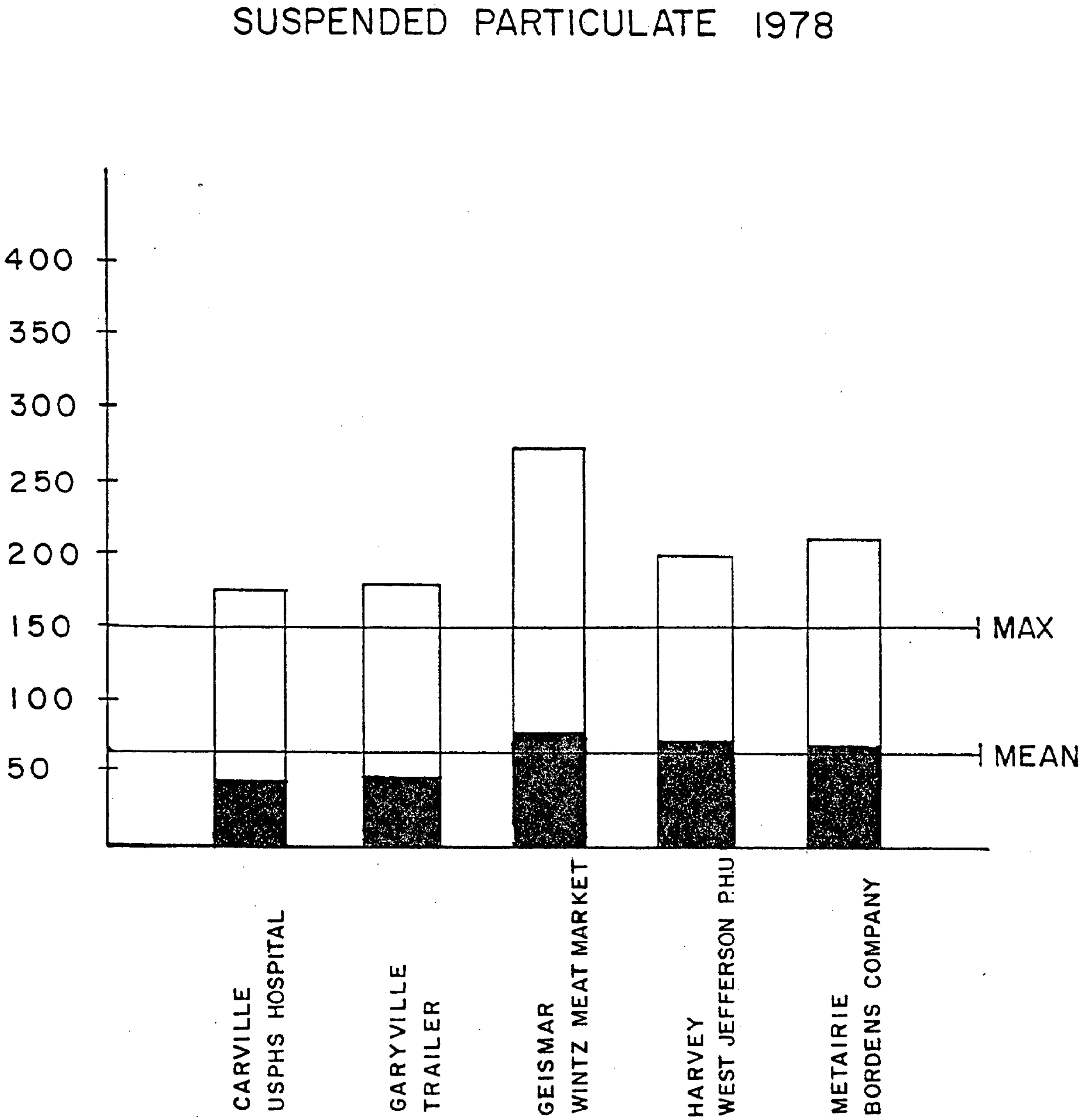
AMBIENT AIR QUALITY STANDARDS

(Non-continuous Data)

PARAMETER		MAXIMUM 24 hour average	ANNUAL GEOMETRIC MEAN	ANNUAL ARITHMETIC MEAN	CONVERSION FACTORS (25°C, 760 mm Hg)
Total Suspended Particulate	Prim.	260 ug/m^3	75 ug/m^3		
	Sec.	150 ug/m^3	60 ug/m^3		
Sulfur Dioxide	Prim.	365 ug/m^3 (0.14 ppm)		80 ug/m^3 (0.03 ppm)	ppm x 2620 = ug/m^3
	Sec.	260 ug/m^3 (0.10 ppm)		60 ug/m^3 (0.02 ppm)	
Nitrogen Dioxide	Prim.			100 ug/m^3 (0.05 ppm)	ppm x 1880 = ug/m^3
	Sec.			100 ug/m^3 (0.05 ppm)	
Soiling Index	Prim.	1.50 COH/1000 linear ft.	0.60 COH/1000 linear ft.	0.75 COH/1000 linear ft.	
	Sec.				

SOURCE: Louisiana Air Control Commission (1978), page 32.

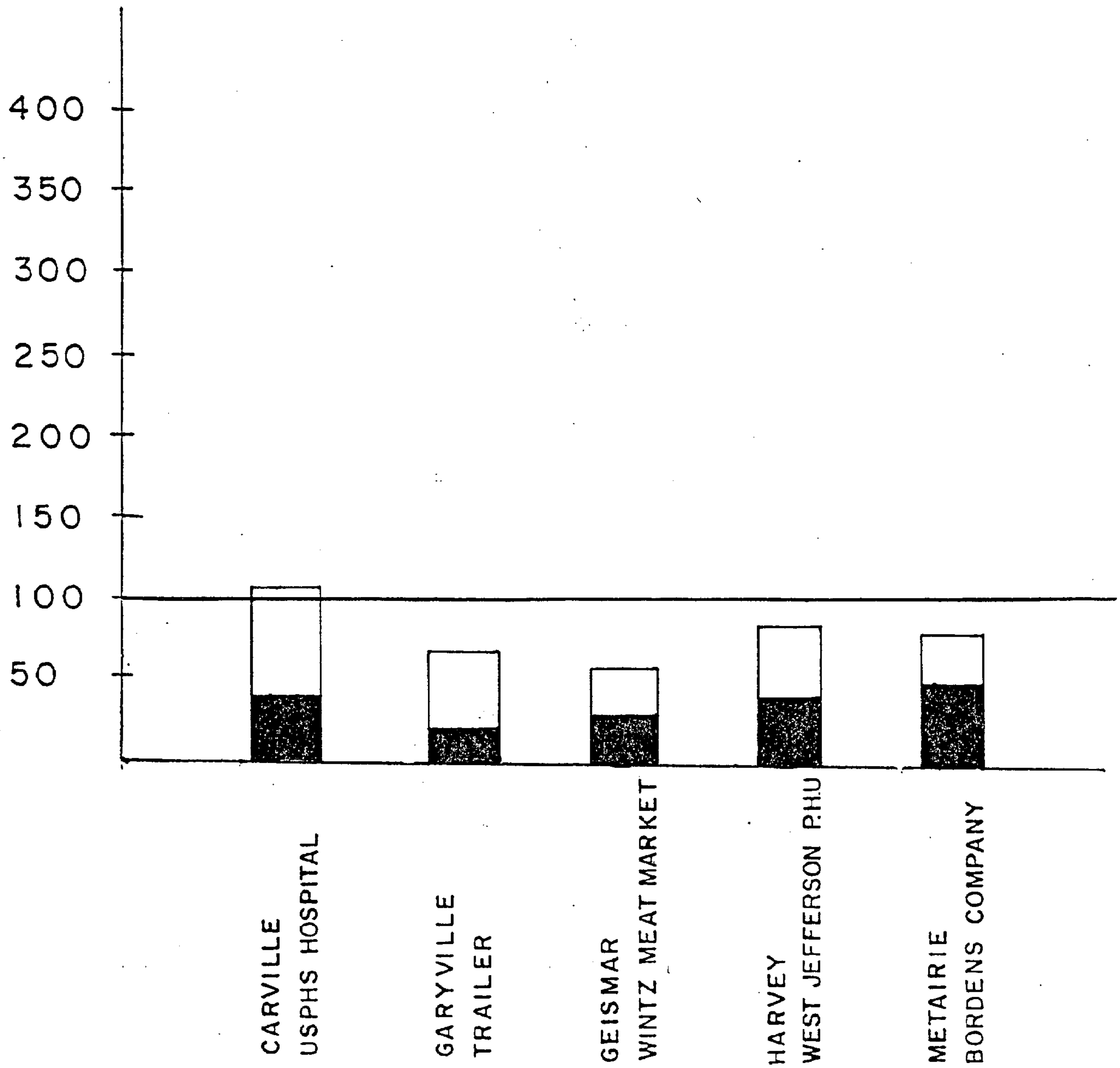
TABLE 1.7



Source: Louisiana Air Control Commission (1979): page 28.

TABLE 1.8

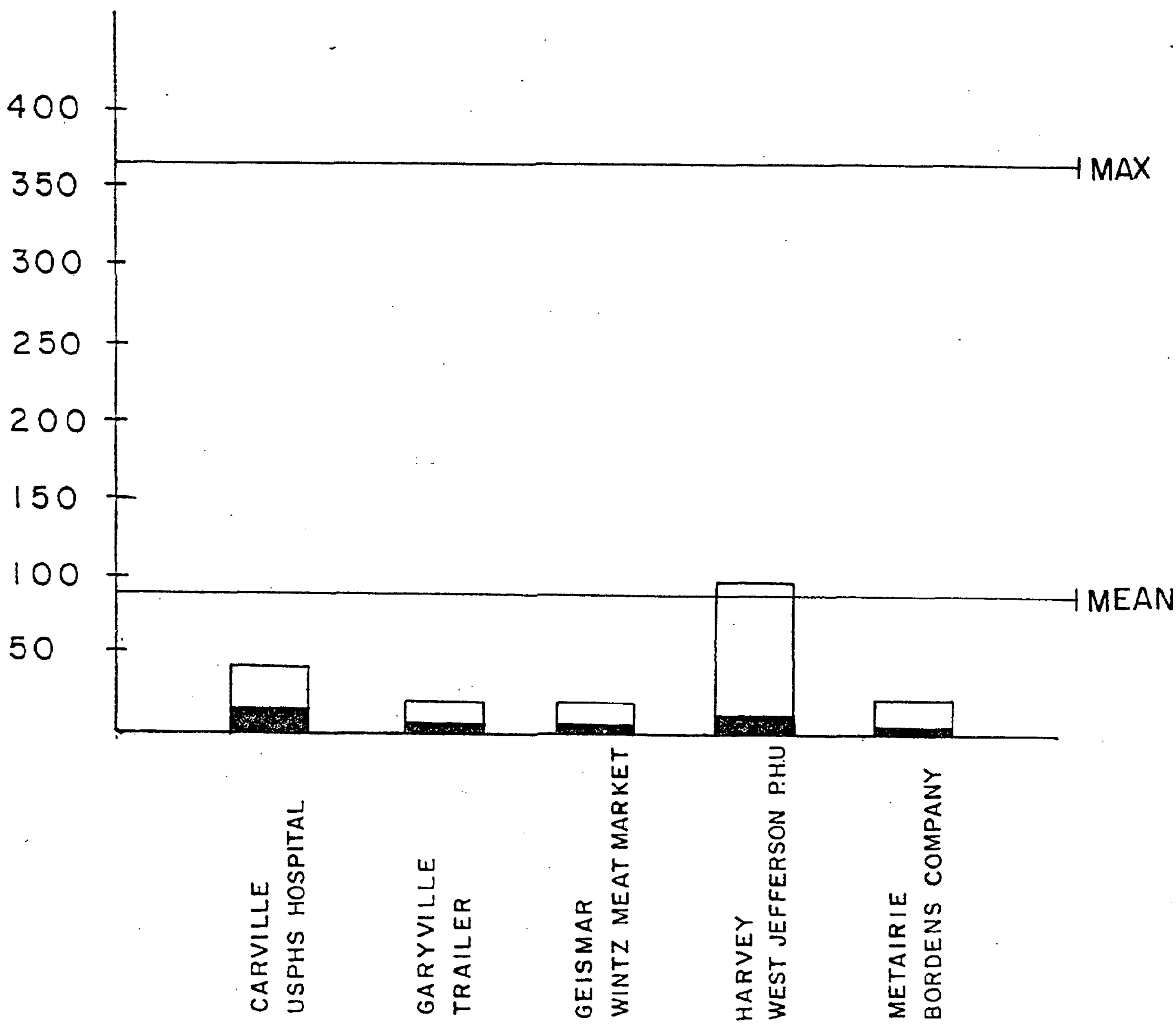
NITROGEN DIOXIDE BUBBLER 1978



Source: Louisiana Air Control Commission (1979): page 28.

TABLE 1.9

SULFUR DIOXIDE BUBBLER 1978



Source: Louisiana Air Control Commission (1979): page 28.

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CHAPTER 2 - GEOLOGY

By

Irwin Fingerman

INTRODUCTION

The South Central Region lies within a geologic basin which has been collecting sediment since the Mesozoic Period (see Figure 2.1 for a geologic time scale). The depth of this sediment to crustal rock is estimated to be in excess of 60,000 feet. Fluctuations in sea level, over time, have caused these sediments to consist mainly of sand, gravel, clay, shale and limestone, during their sequential deposition. During the Cretaceous and Tertiary Period, carbonate coral reefs were distributed in the northern portions of St. John the Baptist, St. Charles and St. James Parishes, and a layer of salt was deposited during the Jurassic Period. The sinking of the Gulf Coast Geosyncline (a belt shaped basin area that subsides deeply) is a continuous process. The basin has downwarped, partially from the weight of the sediment load it has collected and partially from the compaction of the sediment itself. This process has gone on for over 200,000,000 years. Recently, the downwarping has led to subsidence of surface features and to uplifting of the Pleistocene terraces to the north (Figures 2.2 and 2.3). These features are currently extant today in the Florida Parishes of Louisiana and in the South Central District area.

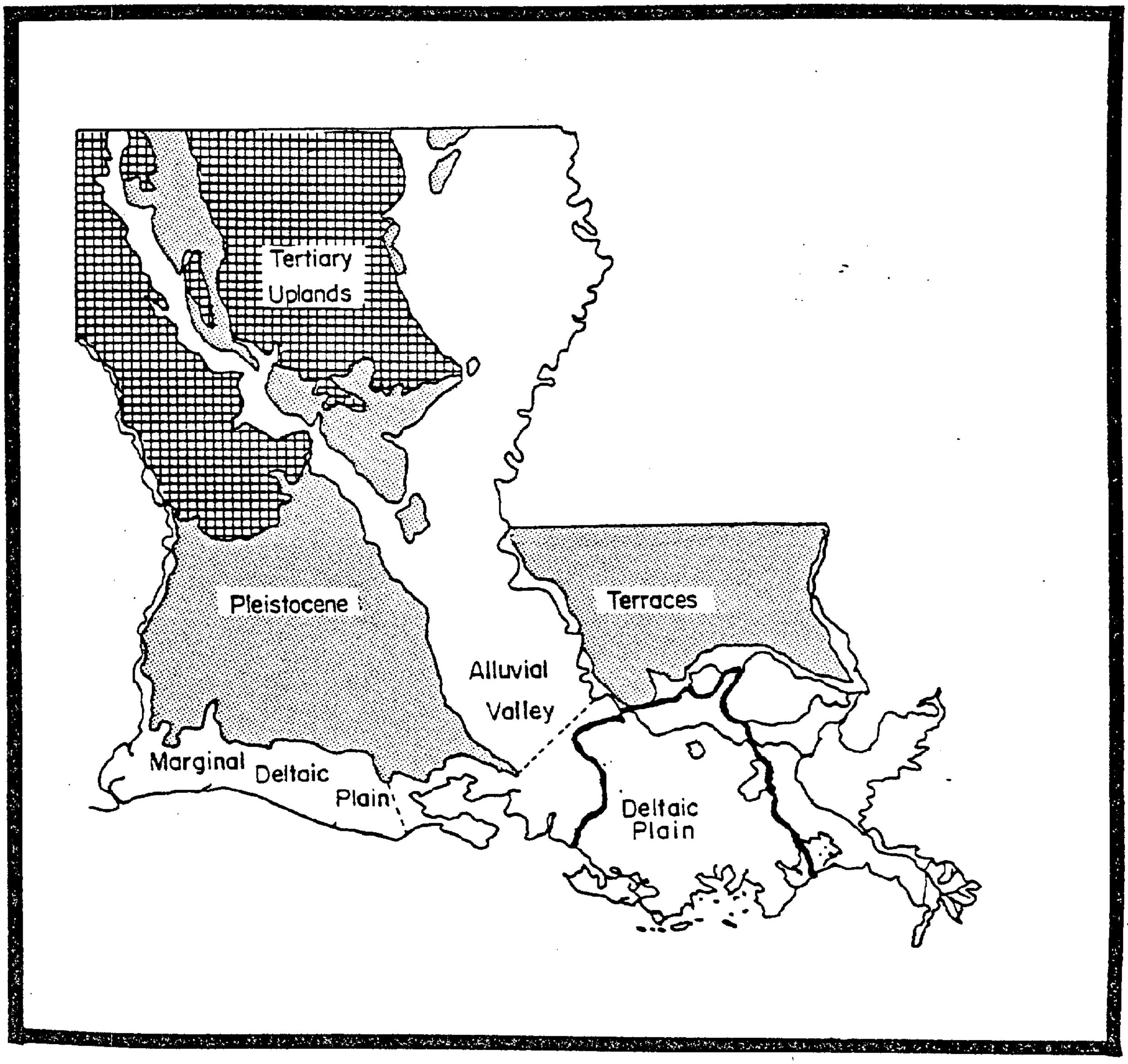
FIGURE 2.1
GEOLOGIC TIME SCALE

ERA	PERIOD	EPOCH	MILLIONS OF YEARS AGO (approx.)	DURATION IN MILLIONS OF YEARS (approx.)	IMPORTANT BIOLOGICAL EVENTS
			Recent began 10,000 years ago		
CENOZOIC	Quaternary	Recent			
		Pleistocene	2.5-3	2.5-3	
	Tertiary	Pliocene		13-15	First men
		Miocene		12	First manlike primates
		Oligocene		11	First apes
		Eocene		22	Grass spreads widely
		Paleocene	63	5-7	First elephants First horses
MESOZOIC	Cretaceous		140	72	Extinction of dinosaurs, giant marine reptiles, flying reptiles, and ammonites First primates Angiosperms spread widely First snakes
	Jurassic		205	65	First sequoias First birds
	Triassic		230	25	First turtles and lizards First dinosaurs and mammals Last giant amphibians
PALEOZOIC	Permian		285	55	Extinction of trilobites, fusulinids, many corals, crinoids, and other invertebrates First mammal-like reptiles
	Pennsylvanian		325	40	First conifers, ferns, and ginkgoes, first reptiles First flying insects
	Mississippian		350	25	First fusulinids Extinction of graptolites First seed plants
	Devonian		410	60	First land-living vertebrates First sharks First forests and insects First ammonites
	Silurian		430	20	First land vegetation and air-breathing animals
	Ordovician		500	70	First bone bearing animals First corals and bryozoans
	Cambrian		600	100	First cephalopods First pelecypods First conodonts First graptolites First gastropods Appearance of many invertebrate phyla: arthropods, mollusks, sponges, and echinoderms
PRECAMBRIAN	Upper Middle Lower	Although many local subdivisions are recognized, no worldwide system of naming has been evolved. The Precambrian lasted for at least 3.5 billion years. Until more is learned, this lengthy interval may be divided into Lower, Middle, and Upper without formal names			

SOURCE: STOKES(1973): pg. 122-123

FIGURE 2.2

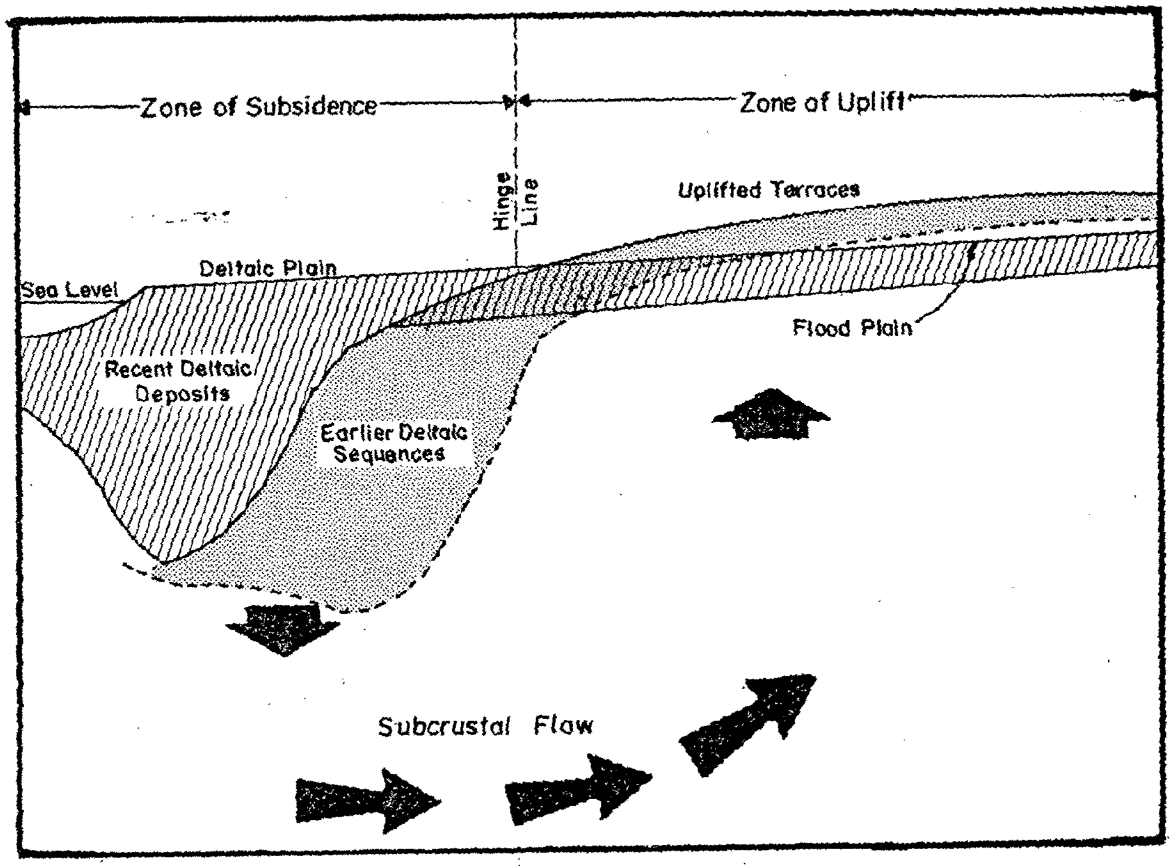
LOUISIANA PHYSIOGRAPHIC REGIONS



SOURCE: MORGAN (1977)

FIGURE 2.3

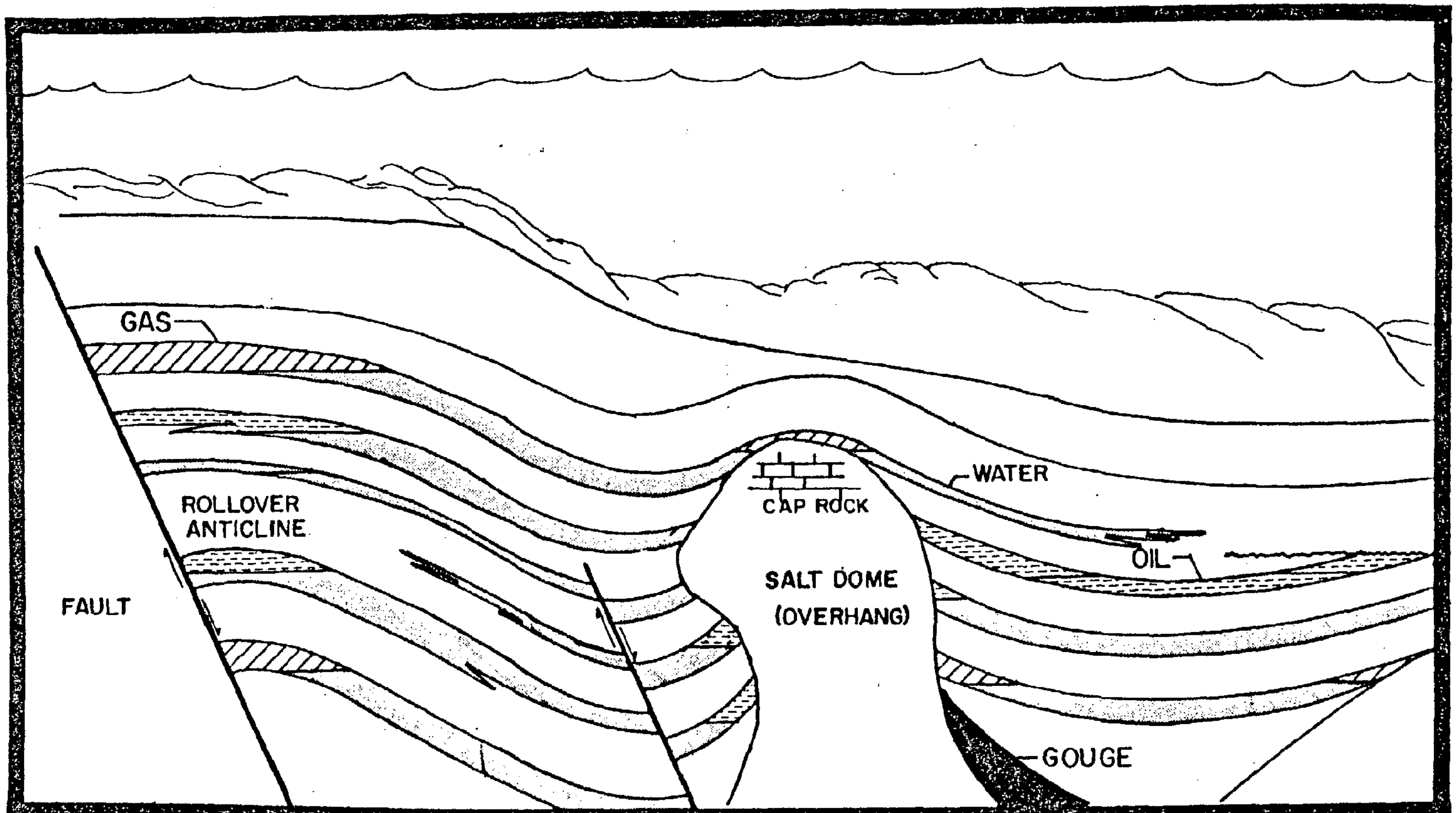
GULF COAST GEOSYNCLINE



SOURCE: MORGAN (1977)

FIGURE 2.4

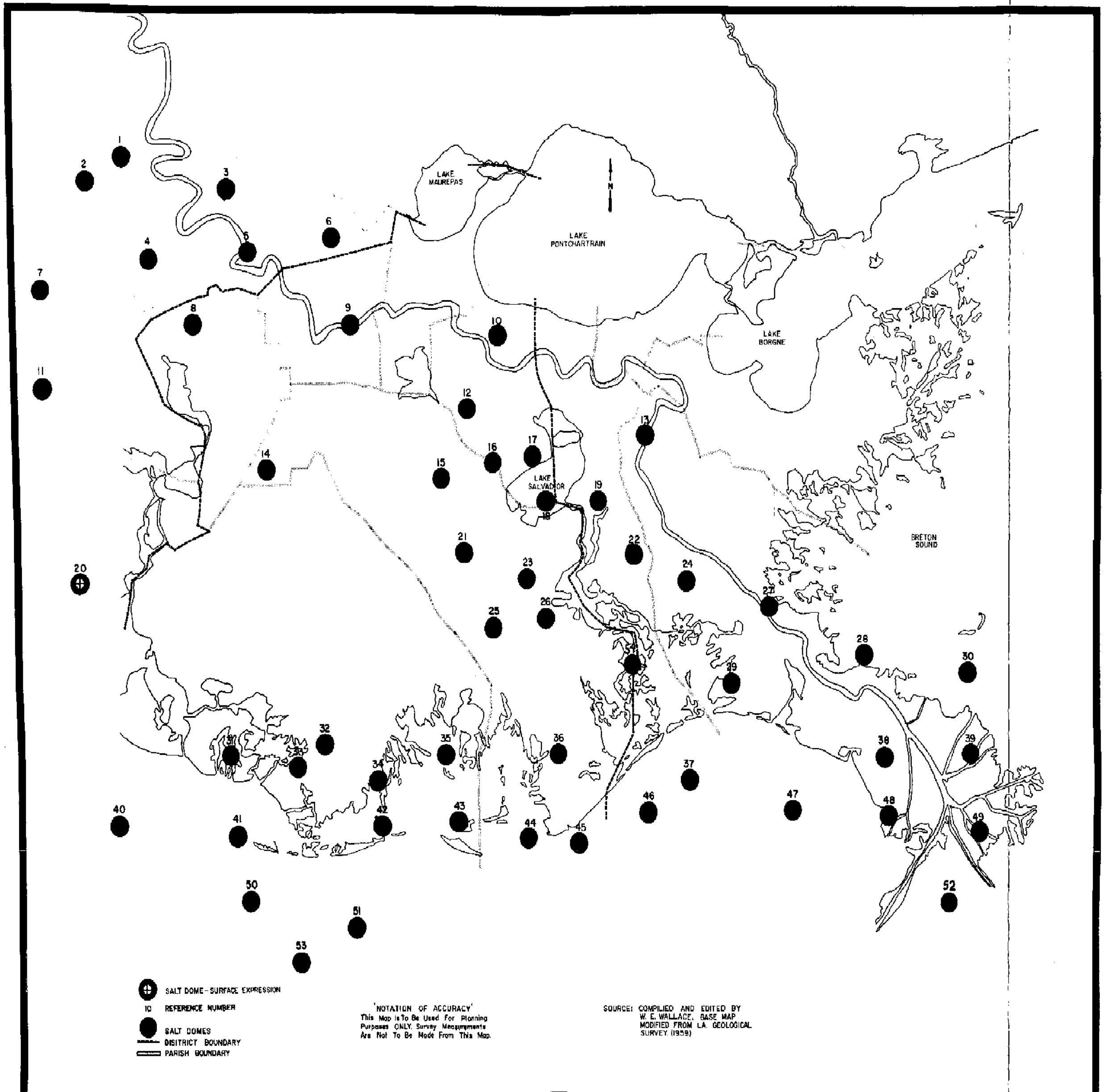
SALT DOME GEOLOGIC STRUCTURE



SOURCE: TEXACO (1979)

FIGURE 2.5

SALT DOMES OF SOUTHEAST LOUISIANA



SALT DOME LOCATER CHART

IBERVILLE PARISH

1. Bayou Choctaw . . . . . 9S - 11E
2. Bayou Bleu. . . . . . . 9S - 10E
3. St. Gabriel . . . . . . 9S - 2E
4. White Castle. . . . . . 11S - 12E

ASCENSION PARISH

5. Darrow. . . . . 10S - 2E
6. Sorrento. . . . . 10S - 4E

ST. MARTIN PARISH

7. Lake Mongoulois . . . . 10S - 9E
11. Lake Chicot . . . . . . 11S - 10E

ASSUMPTION PARISH

8. Napoleonville . . . . . 12S - 13E

ST. JAMES PARISH

9. Hester-Vacherie . . . . 12S - 13E

ST. CHARLES PARISH

10. Good Hope . . . . 12S - 8E
12. Paradis . . . . 14S - 20E
16. Bayou des Allemands. . . 15S - 20E
17. Bayou Couba . . . . . . 15S - 21E
18. Lake Salvador . . . . . 16S - 23E

PLAQUEMINES PARISH

13. Stella . . . . 14S - 23E
24. Lake Hermitage . . . . 18S - 25E
27. Potash . . . . 18S - 15E
28. Quarantine Bay . . . . 19S - 17E
29. Lake Washington. . . . 20S - 26E
38. Venice . . . . 22S - 30E
39. Delta Duck Club. . . . 21S - 20E
48. West Bay . . . . 23S - 30E
49. Garden Island Bay. . . 23S - 32E

LAFOURCHE PARISH

14. Chacahoula . . . . . . 15S - 15E
15. Raceland . . . . 15S - 19E
21. Valentine. . . . . . . 17S - 20E
23. Cut Off. . . . . 18S - 21E
25. Bully Camp . . . . . . 18S - 20E
26. Clovelly . . . . 18S - 22E
36. Leeville . . . . 21S - 22E
44. Timbalier Bay. . . . . 23S - 21E
54. Bay de Chene . . . . . 19S - 24E

JEFFERSON PARISH

19. Barataria. . . . . . . 16S - 23E
22. Lafitte. . . . . 17S - 24E

ST. MARY PARISH

20. Belle Isle . . . . . . 17S - 10E

TERREBONNE PARISH

31. Bay Junop . . . . 21S - 14E
32. Four Isle Dome. . . . . 21S - 16E
33. Dog Lake. . . . . 21S - 16E
34. Bay St. Elaine. . . . . 22S - 18E
35. Lake Barre. . . . . . . 21S - 20E
42. Lake Pelto. . . . . . . 23S - 18E
43. Caillou Island. . . . . 23S - 20E

OFFSHORE

MAIN PASS AREA

30. BL. 46

GRAND ISLE AREA

37. BL. 18
46. BL. 16

SHIP SHOAL AREA

40. BL. 32
41. Coon Point (BLK. 39)
50. BL. 72
53. BL. 113

BAY MARCHARD AREA

45. BL. 2

WEST DELTA AREA

47. BL. 30

SOUTH PELTO AREA

51. BL. 20

SOUTH PASS AREA

52. BL. 27

ECONOMIC AND STRUCTURAL GEOLOGY

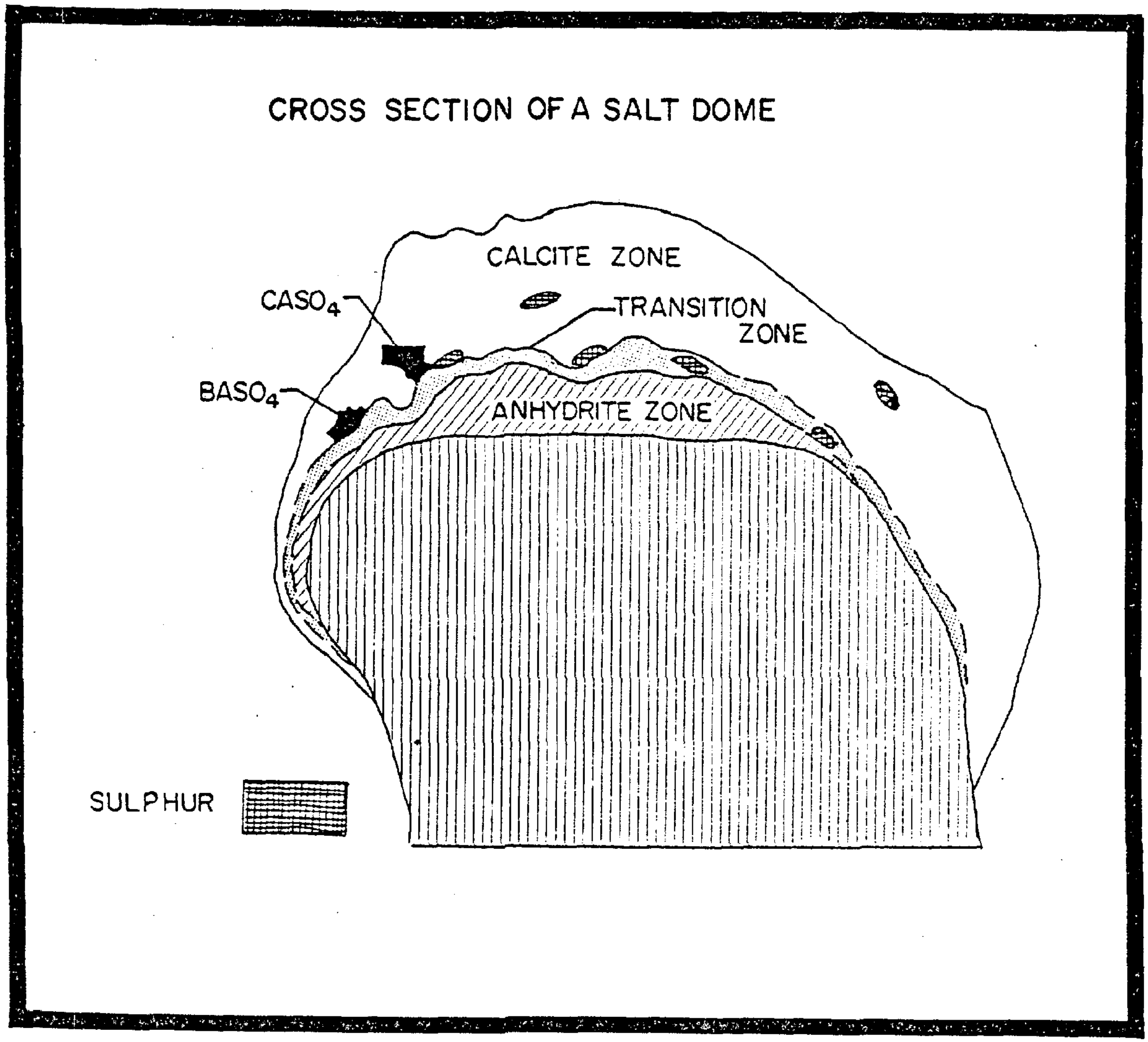
Economically, the Gulf Coast geosyncline is very important. Deposits of natural gas, oil, sulphur and salt are numerous. These natural resources have been found in the Miocene Age or younger strata. The South Central Region is one of the nation's leaders in oil and gas production. These deposits, to a large degree, depend upon a phenomena in the area known as salt domes. Salt domes are intrusions of a Jurassic salt layer which, due to the enormous pressure subjected on the salt by overlying sediments and strata and to its ability to flow to areas of less pressure, are slowly rising toward the surface. This movement toward the surface includes breaking through the overlying strata or deforming it (Figure 2.4).

Some of these domes of salt have risen as much as 40,000 feet from their original depth and several even have surface expressions of over 100 feet mean sea level (m.s.l.). No salt domes have reached the surface in the South Central District however. Figure 2.5 shows the locations of salt domes within the South Central Region.

Oil and gas deposits are trapped by the piercement of strata by the salt dome. This allows the deposits to pool along the side of the salt. The deformation of the overlying strata also allows for pooling and trapping of oil and gas deposits (Figure 2.6).

Sulphur, basite, gypsum, calcite and anhydrite are formed in a portion of the salt dome called the cap rock (Figure 2.6). Anhydrite precipitates out of groundwaters which come into contact with the salt, and the other minerals are formed by alteration of the anhydrite. The salt and sulphur can be mined. Examples of this inlcude Avery Island

FIGURE 2.6



SOURCE : MORGAN (1977)

and Jefferson Island, Louisiana which are currently operating salt mines on salt domes that have pierced the surface.

Oil and gas are also trapped by pinchouts of sand layers and by faults. Faults are a disruption of the strata that change the general alignment of the strata. Salt domes usually have numerous faults above them. Sometimes, however, faults are caused by other means. The South Central Region is crossed by a series of fault systems which trend west to east (Figure 2.7). These faults were brought on by the nature of the deposition of sediment causing weak sections of strata to give way or by salt layers applying pressure from below. Geologists are not certain what the origin of the fault systems is. In most cases in the South Central District, these faults are buried by newer sediment and thus have no surface expression.

SUMMARY

The geology of the region is complex. Certain geologic processes are still continuing. The Gulf Coast Geosyncline continues to subside and salt domes are still moving toward the surface. Surface expressions of recent geology will be discussed in Chapter 3, entitled Geomorphology.

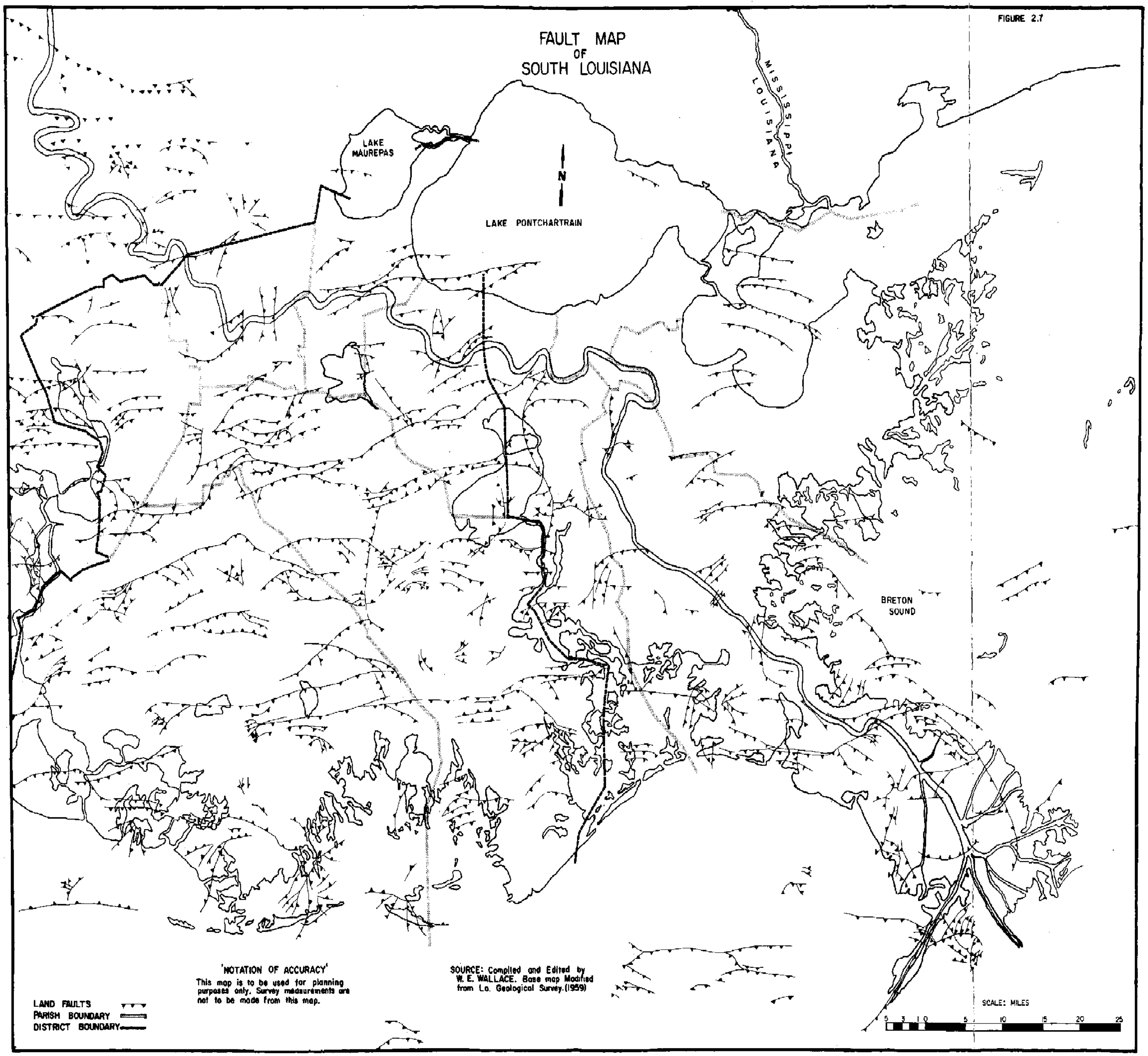


FIGURE 2.7
FAULT MAP
OF
SOUTH LOUISIANA
LAKE MAUREPAS
LAKE PONTCHARTRAIN
N
MISSISSIPPI
LOUISIANA
BRETON SOUND
'NOTATION OF ACCURACY'
This map is to be used for planning purposes only. Survey measurements are not to be made from this map.
SOURCE: Compiled and Edited by W. E. WALLACE. Base map Modified from La. Geological Survey.(1959)
LAND FAULTS
PARISH BOUNDARY
DISTRICT BOUNDARY
SCALE: MILES
5 3 1 0 5 10 15 20 25

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CHAPTER 3 - GEOMORPHOLOGY

By

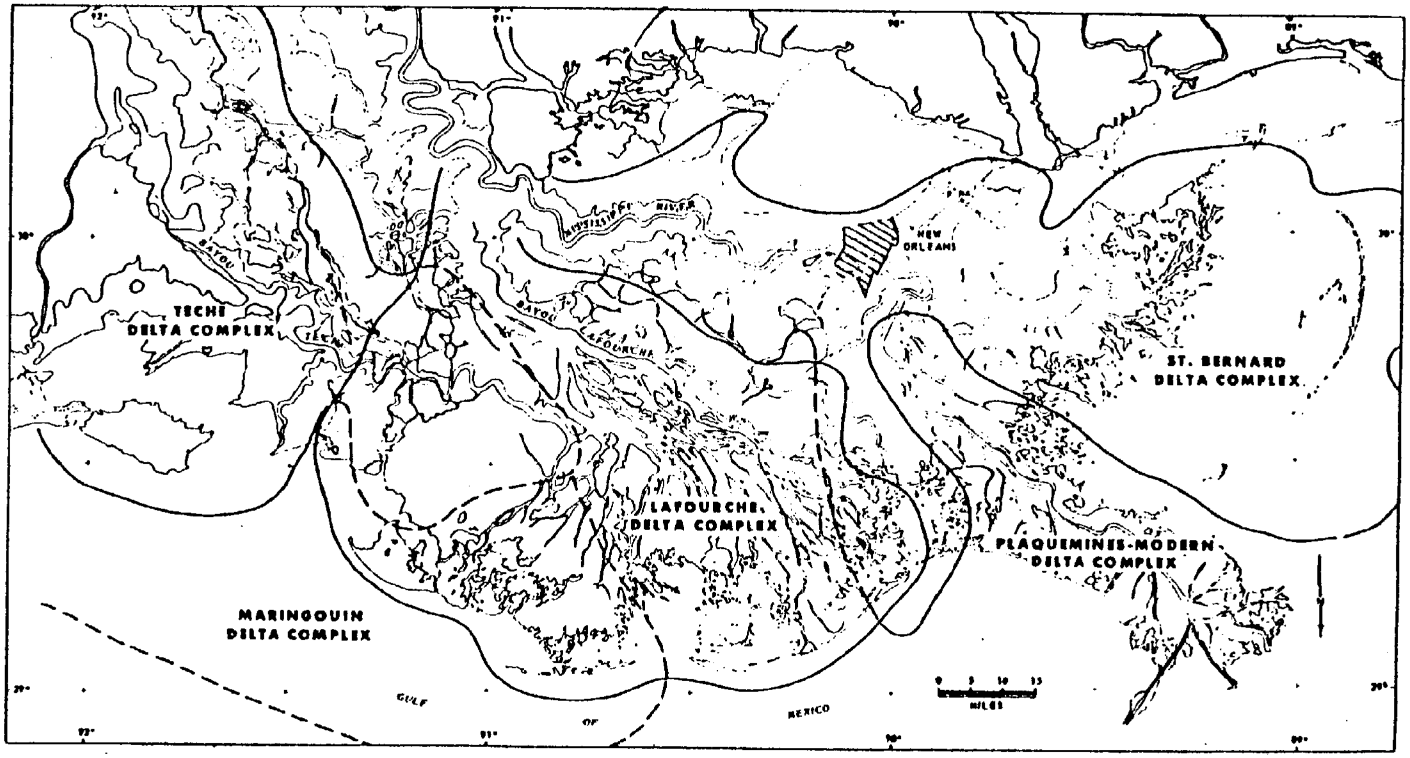
Edwin J. Durabb

INTRODUCTION

The land area of the South Central District sits astride one of the most dynamic geomorphological systems in the United States, the Mississippi River Deltaic Plain. Prior to 6,000 years ago, the land area now exposed in our district was part of the continental shelf of the Gulf Coast and largely under water. From that point to the present, the Mississippi River distributary system has created several delta lobes extending far out into what once was the Gulf of Mexico (Gagliano & Van Beek, 1970). Figure 3.1 illustrates the aerial extent of the main deltas formed by the river as it shifted its course in the coastal waters of Louisiana. As one can easily see, these deltaic land forms extended much further into the Gulf than their current land expressions indicate. Severe erosion has destroyed land areas no longer occupied by the main river channel. The dynamic cycle of delta building and erosion has thus created the unique landscape that has delineated the resource base and settlement patterns existing today in the district. The following sections explain the alluvial processes that have shaped our landscape and the results of natural interactions on the system.

FIGURE 3.1

DELTAS OF THE MISSISSIPPI



SOURCE : GAGLIANO & VAN BEEK (1970)

RECENT GEOLOGIC HISTORY

The physical expression of the geology of Southern Louisiana can be classified into four areas; the Pleistocene terrace, the marginal deltaic plain, the deltaic plain and the alluvial valley. Northwestern Assumption Parish lies in the alluvial valley area, the remainder of the region lies within the deltaic plain.

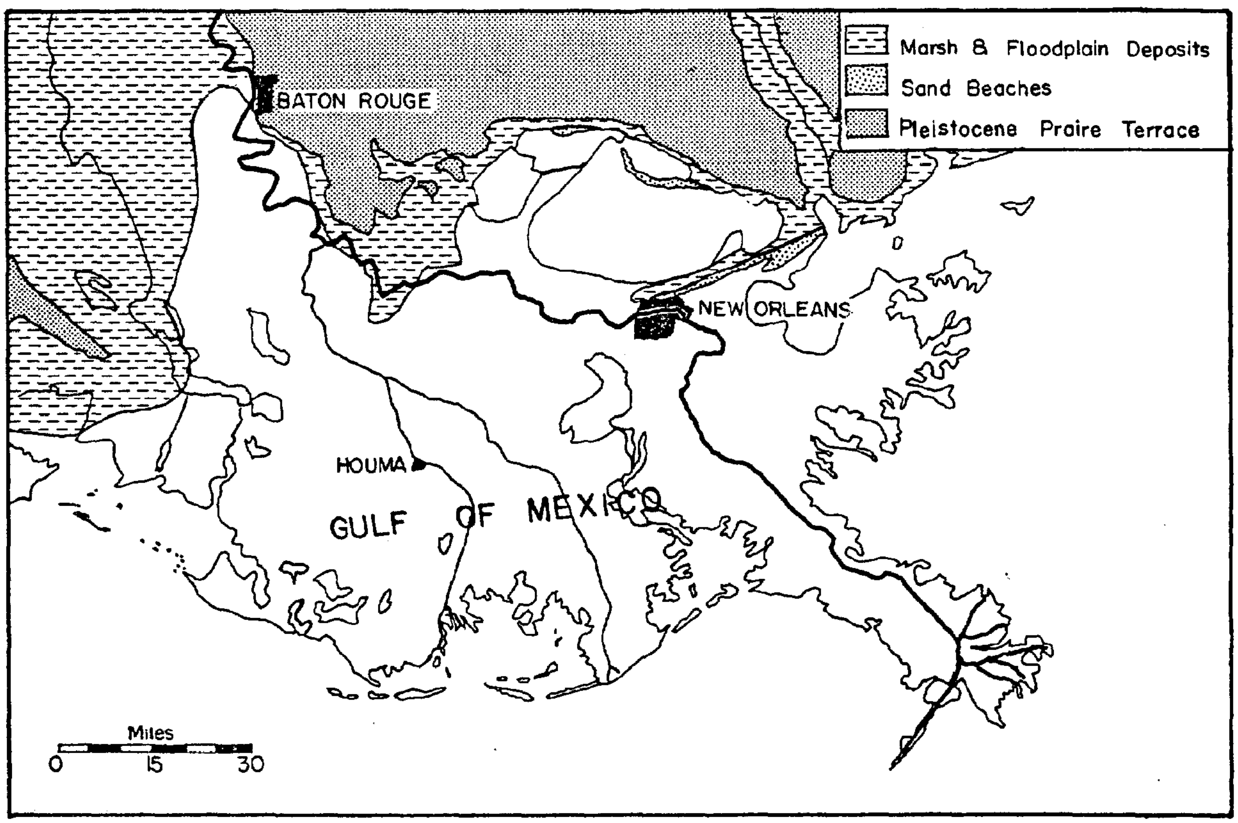
The alluvial valley area consists of sediment (alluvium) deposited within the Mississippi River Valley as it cut through the tertiary uplands and Pleistocene terraces (see Figure 2.1 for their relative ages). The deltaic plain area was originally under water.

Approximately 18,000 to 20,000 years ago the sea level was lowered about 390 feet below current sea level. This was in response to continental glaciation. The shoreline was relocated close to the outer margin of the continental shelf (Figure 3.2). The Mississippi River cut a trench into the resultant Pleistocene prairie terrace in an effort to adjust to the new sea level. This trench occurred west of the present course of the Mississippi, probably in the western portion of the South Central Region.

The sea level started to rise about 18,000 years ago. Streams began filling in their valleys in an attempt to adjust to the rising sea level. About 6,000 years ago the rise in the sea level slowed, but continued until it reached its current level. The Pleistocene prairie was inundated and the coastline relocated to what is now far inshore (Figure 3.3). It was at this point that the Mississippi River began to shape the landscape that currently exists in the South Central Region.

FIGURE 3.2

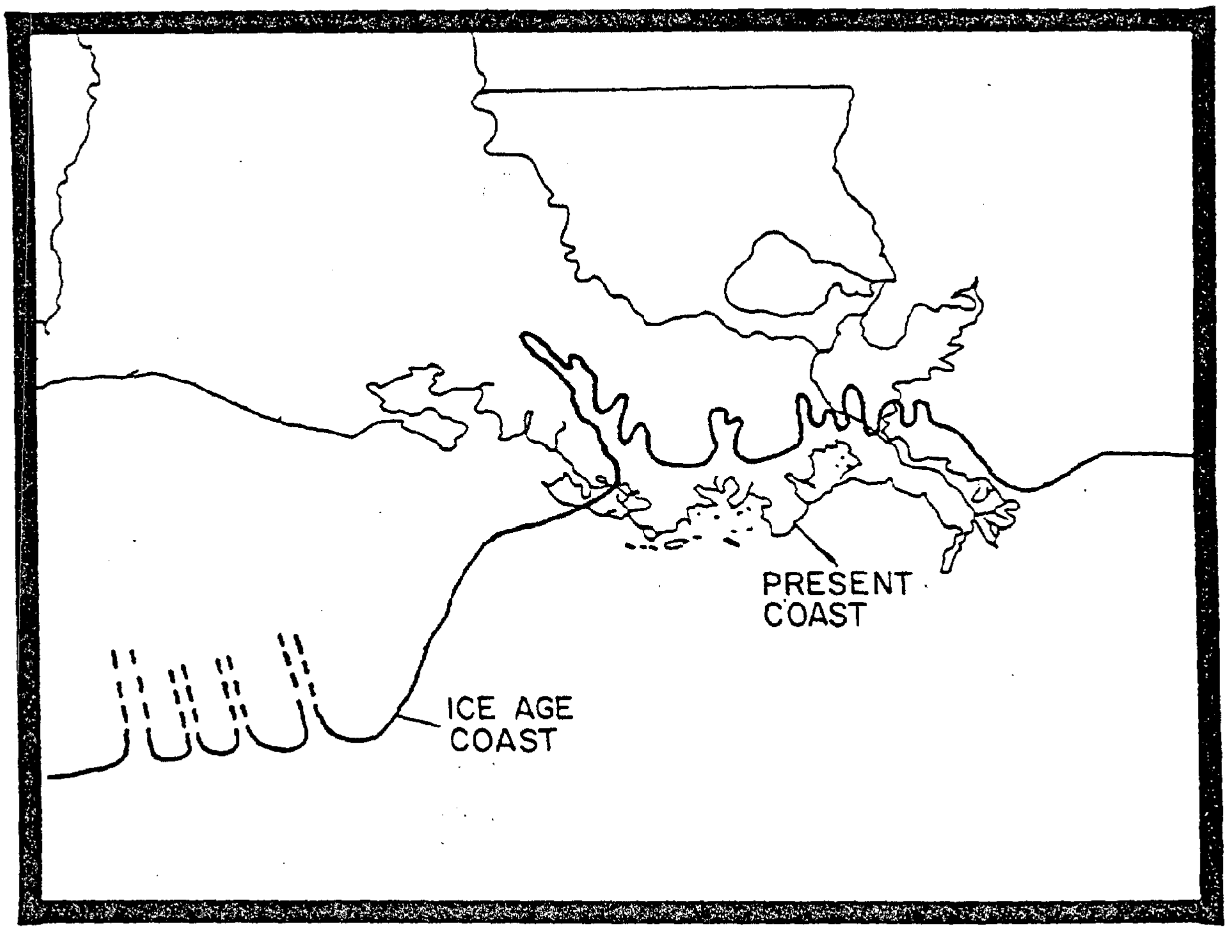
APPROXIMATE POSITION OF THE SHORELINE DURING MAXIMUM GULF OF MEXICO TRANSGRESSION



SOURCE: MORGAN (1977)

FIGURE 3.3

ICE AGE LOUISIANA SHORELINE
GREATEST SEAWARD ADVANCE



SOURCE: MORGAN (1977)

RECENT ALLUVIAL PROCESSES

During the last 6,000 years after sea level adjusted itself to near its present level, the Mississippi River began discharging huge amounts of sediment onto the continental shelf. In the process of deposition, areas that were once sea bottom were elevated above the ocean as deltaic deposits accumulated. The River continually shifted course, always seeking a shorter path to the sea, thus abandoning one delta and creating a new one. During these meanderings over the last 7,500 years, six delta complexes have been created by the River. These are:

1.	Maringouin	7500–6200 years ago
2.	Teche	5700–3900 years ago
3.	St. Bernard	4700– 700 years ago
4.	Lafourche	3500–Present
5.	Plaquemines/modern	1000–Present

Figures 3.4 and 3.5 illustrate the shifting courses of the Mississippi as it deposited sediment across the continental shelf in Louisiana.

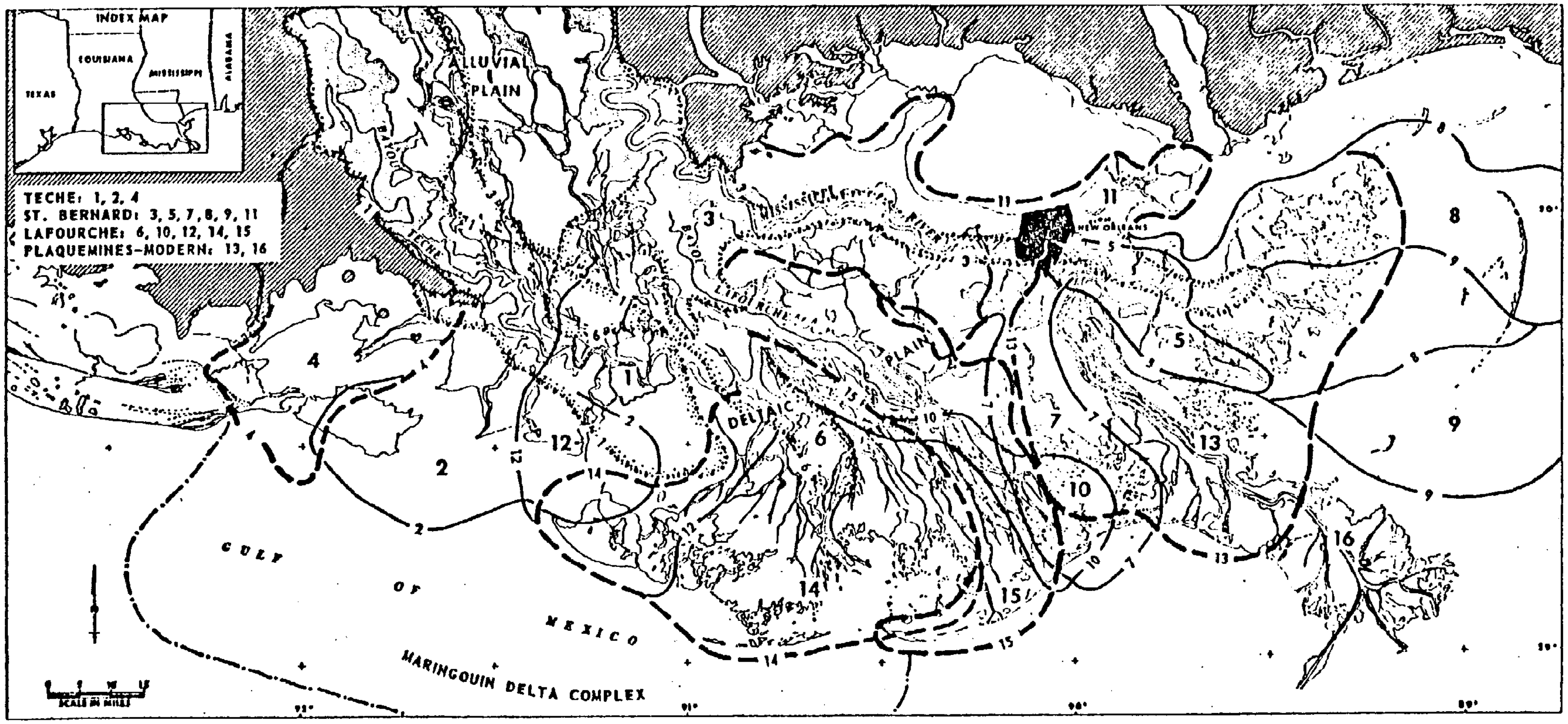
Of the major delta systems only the earliest (Maringouin) has no surface expression. Deltaic lobe systems that have created the land of the South Central Region include the Teche, Lafourche and St. Bernard systems. Because these deltas were formed at different times and locations, they are in various stages of development as landforms.

The deltaic depositional distributory system created discrete landform systems in the South Central Region. These are:

1. Natural Levees (Depositional Landform)
2. Inter-Distributary Basins (Depositional-Subsidence Landform)
3. Barrier Island/Beach Ridges (Erosional Landform)

FIGURE 3.4

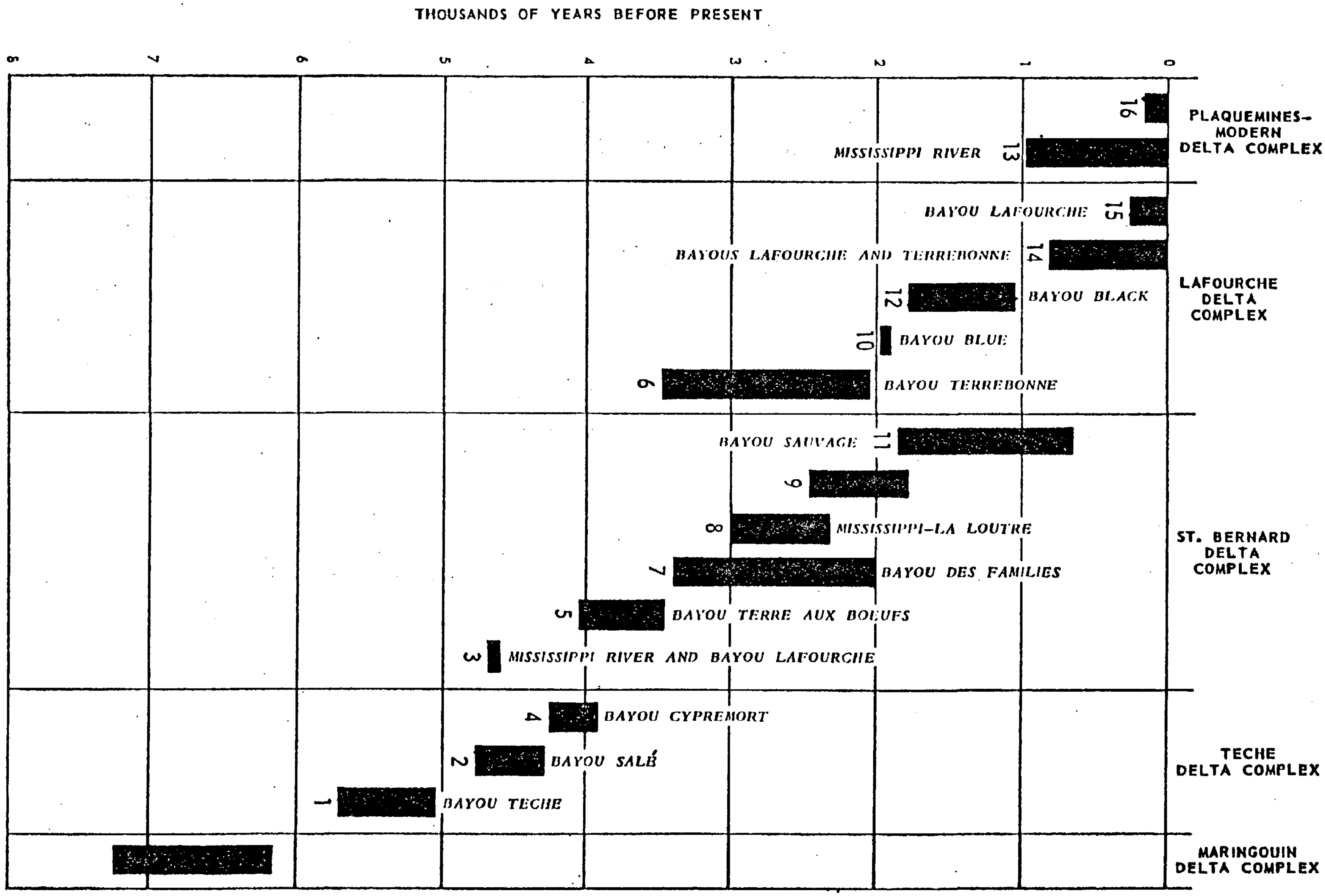
IDENTIFICATION MAP FOR DELTA LOBES OF THE MISSISSIPPI



SOURCE GAGLIANO & VAN BEEK

FIGURE 3.5

TIME SEQUENCE FOR MISSISSIPPI DELTA LOBES



SOURCE: GAGLIANO & VAN BEEK (1970)

The natural levees extant in our region include those of the Lafourche, St. Bernard and Modern deltaic lobes. The inter-distributary basins are the Pontchartrain, Barataria and Terrebonne Basins (see Chapter 6). The processes leading to the formation of these features are discussed in the following sections.

Factors Affecting the Current Landscape

There are four main factors affecting the landscape that have interacted to create the current landforms of our region. These are:

1. Sediment Deposition
2. Erosion
3. Subsidence
4. Man-Made Alterations

Sediment Deposition

The delta building process created the existing landforms by deposition of sediment first under water, then on the surface on the delta's own sediment base. After the delta floor reached the level of the sea, a system of ridges and basins formed a part of the deltaic plain. The alluvial ridges called "natural levees" were formed when the river flooded during the springtime. Heavy suspended sediment (silt) was dropped as soon as the flow rate of water decreased as a result of overbank flooding. Later, vegetation also helped to hold back sediment. The mature resultant landform consisted of the river flanked by two ridges of silt, gradually sloping away from the channel (reflecting the decreased sediment deposition away from the main distributary). Deposition in the inter-distributary basins consisted mainly of fine clays and thus deposition here proceeded at a slower rate. The historical settlement patterns in the South Central Region reflect a linear pattern coinciding with these higher-drier ridges of good alluvial silt deposits (see Part II, Chapter 1).

Erosion and Subsidence

Two processes that run concurrent with, and continue after delta building in coastal Louisiana, are subsidence and erosion. Erosion of the deltaic deposits come from the sea, mainly during intense storm periods. After deltaic deposition slows or stops in reaction to a shifting river channel, erosion rapidly reclaims much of the area that was once land. As waves, especially during storms, erode the coastline of an abandoned deltaic plain, features known as barrier islands are produced. Barrier Islands have been defined as:

> Elongate, thin structures parallel to the shoreline of unconsolidated sediments (usually sand) . . . They are separated from the marshland by estuarines and wetlands . . . and are generally located in areas with low sloping coastal plains and moderate tidal range.
>
> Conservation Foundation (1976), page 1.

The main factors shaping the barrier islands of Louisiana and other areas of the United States have been described thusly:

> Barrier islands are dominated by energy stresses. Exceptional wave force, wind and tidal energies, and ocean flooding are the predominant factors which shape and regulate the barrier island ecosystem. As a result of these factors, barrier islands are extremely dynamic systems, constantly subject to change. Seasonal and other regular cyclic fluctua tions in wave patterns and intensity combine with irregular ocean storms and hurricanes to form and reform island profiles. The beaches and dunes migrate in response to these fluctuations. Storm overwash periodically carries sand onto the island, leaving substantial deposits of new sediments. The result is that morphologically, the islands are in a continual state of influx. While we generally recognize the great impact that hurricanes have on barrier islands, I should emphasize that they play an equally important role in shaping the islands.
>
> Conservation Foundation (1976), page 1.

In Louisiana the barrier island off the coast of Terrebonne and Lafourche Parish is derived from silt deposits from the current delta of the Mississippi River, as well as erosional reworking of old silt deposits.

The stranded barrier beaches of Lafourche Parish were developed in a similar manner.

These features serve as unique ecosystems in themselves. They also protect the vulnerable marshlands behind them from rapid erosion. Currently, the barrier island complexes in the South Central District are diminishing is size due to lack of sediment replenishment and man-made alterations in the ecosystem.

Natural subsidence originates from two factors; compaction and geologic subsidence.

Structural geologic subsidence (see Chapter 2) has occurred for millions of years. The weight of overlying sediment contributes to this process. Compaction occurs as sediments "settle" or consolidate over time, thus lowering the surface level. The results of these two processes is the eventual destruction of the entire deltaic landform once deprivation has ceased in the area.

Man-Made Alterations

Three man-made alterations to the natural system have served to speed up the destruction of the deltaic land mass that is the South Central Region. These are:

1. Levee-Building
2. Reclamation
3. Channelization of Wetlands

Although the levee ridges are dry areas for most of the year, artificial levees were built to prevent the occurrence of disastrous river flooding that constantly plaqued early settlers in the area. These levees also halted deposition of new sediment onto the deltas where they were built, thus preventing further deltaic development.

Reclamation, which has occurred mainly in this century, attempted to expand settlement into the low-lying water covered basins flanking the natural levees. During the natural process of subsidence, peat (partially decomposed organic matter) accumulating on top of old sediments in the basins helped keep pace with subsidence and maintain a surface level near to mean sea level. Once the land was drained and leveed, however, this peat oxidized and decomposed causing the level of the land to drop below sea level. The land must be kept dry by artificial means (pumps). Should the levees break, the area would revert to a shallow water body due to the artificial increase in subsidence brought about by the reclamation process.

Channelization of wetlands in the inter-distributary basins for navigation and mineral exploration has contributed to land loss by several means. Erosion and salinity changes brought about by these straight deep channels have destroyed the vegetation that holds together the peat and clay deposits that make up the basins. Without this protection most of the land succumbs quickly to erosion and is lost. (The man-made alterations to the landscape will be discussed further in later chapters.) Total land loss (natural and man induced) is currently estimated at 16½ square miles per year in Louisiana. The Geologic Subsidence Rate is calculated to be approximately one foot per century from natural causes (Gagliano and Van Beek, 1970).

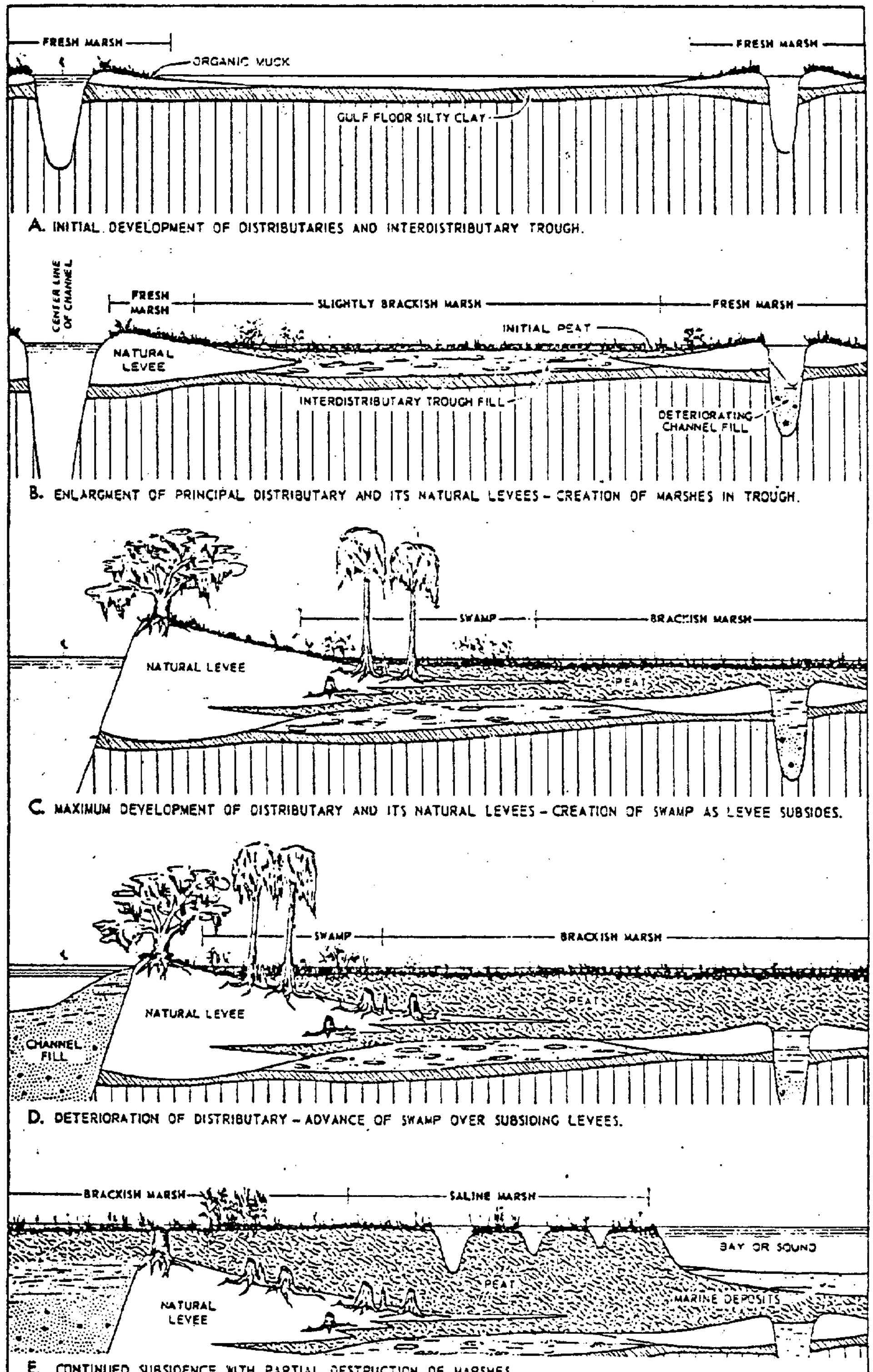
Figure 3.6 is an illustrative example of a natural levee/basin structure of a deltaic lobe moving through the various stages of delta building and decay. Most of the delta lobes in our region fall to classes B and C. The upper more extensive ridge/basin structures are still intact while the lower ends of the delta have suffered the ravages of erosion and subsidence. Figure 3.7 illustrates the various landforms extant in the South Central Region at present.

SUMMARY

It is apparent from the previous discussion that the entire region is a young dynamic geomorphological area, the features of which have shaped the patterns of settlement and the economic activity in the past and in the present. More details on human habitation and its effect on this environment, can be found in Section II of this report.

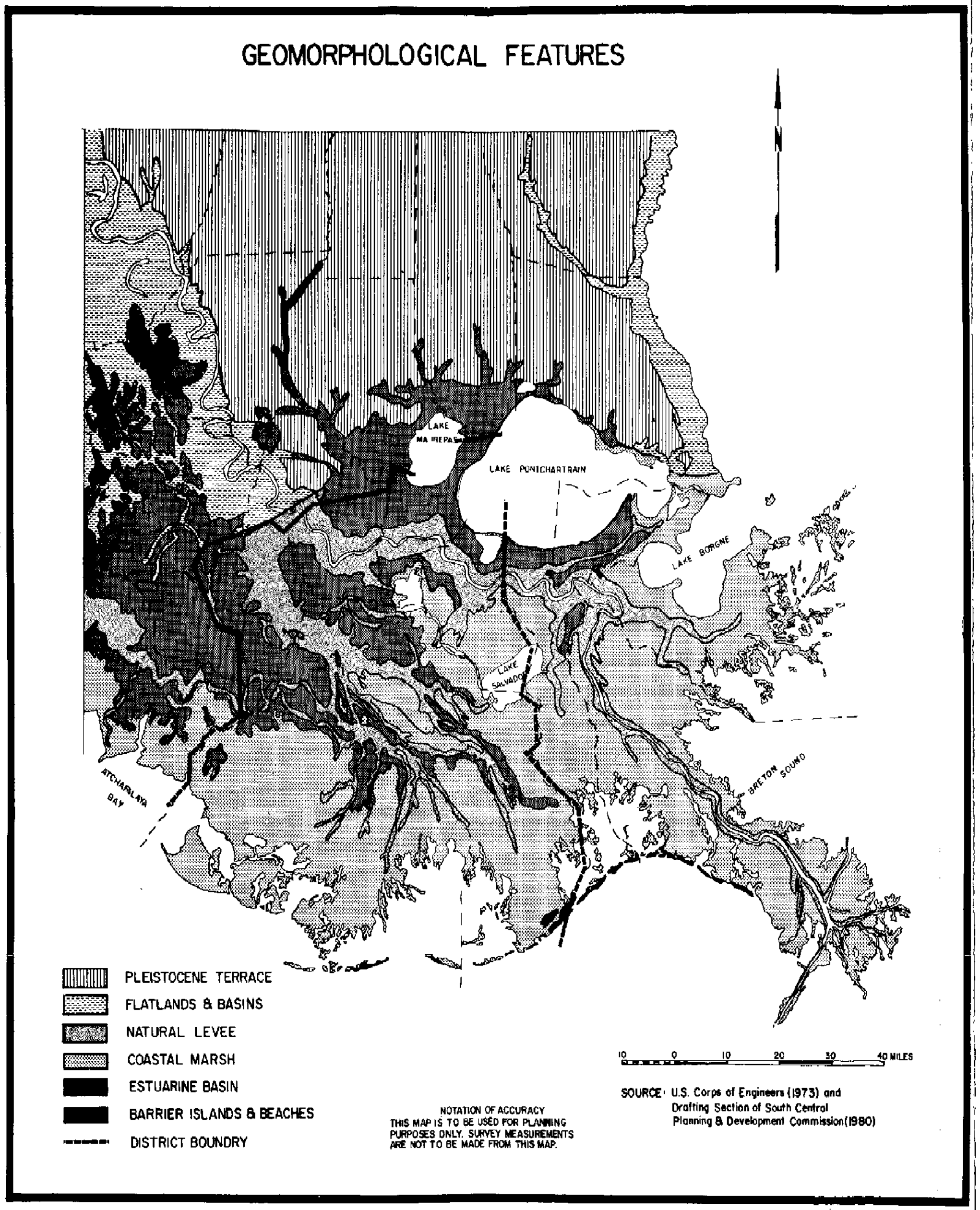
FIGURE 3.6

LIFE CYCLE CROSS SECTION OF A DELTAIC PLAIN



SOURCE: GAGLIANO & VAN BEEK (1970)

FIGURE 3.7


GEOMORPHOLOGICAL FEATURES
N
LAKE MAUREPAS
LAKE PONTCHARTRAIN
LAKE BORGNE
LAKE SALVADOR
ATCHAFALAYA BAY
BRETON SOUND
PLEISTOCENE TERRACE
FLATLANDS & BASINS
NATURAL LEVEE
COASTAL MARSH
ESTUARINE BASIN
BARRIER ISLANDS & BEACHES
DISTRICT BOUNDRY
NOTATION OF ACCURACY
THIS MAP IS TO BE USED FOR PLANNING PURPOSES ONLY. SURVEY MEASUREMENTS ARE NOT TO BE MADE FROM THIS MAP.
10 0 10 20 30 40 MILES
SOURCE: U.S. Corps of Engineers (1973) and Drafting Section of South Central Planning & Development Commission (1980)

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CHAPTER 4 - SOILS

By

James B. Edmonson

INTRODUCTION

In general, soil refers to the loose surface of the earth as distinguished from solid rock. The four components which make up all soils include: mineral matter, organic matter, water, and air. For example, an ideal soil for gardening purposes would be as follows: mineral matter - 45 percent; organic matter - 5 percent; water - 25 percent; and air - 25 percent.

Soils undergo continual change, which escapes a casual study of soil. Each soil has a life cycle in terms of geologic time. This evolutionary nature of soil is effected by climate and living matter (plants and animals), acting upon parent material as conditioned by relief (slope) over periods of time. As soils develop, they stratify into layers called horizons. Typically there are three general horizons: A, B, and C (Foth, 1972).

The nature of the parent material, slightly altered or weathered material from which soil is formed, has a decisive effect on a soil's properties. These properties of the soil include texture (sands, silts, or clay), mineralogical composition, and degrees of stratification. In South Central Louisiana, the parent material is derived from water-deposited sediments, or alluvium.

Alluvial deposits are scattered into narrow, irregular strips bordering streams, rivers and bayous. A common characteristic of this parent material is its stratification layers of different sized particles overlying each other. Mineralogically, alluvium is related to the soils which served as a source of material.

Most alluvium is carried and deposited during floods. It is at this period that erosion is most active and the carrying capacity of streams is at a maximum. When a flooding stream or bayou overflows its banks, its carrying power is suddenly reduced as the flow area increases and velocity decreases. This causes the coarse sands and gravels to settle along the bank, where they form conspicuous ridges called natural levees. As the water reaches the back swamp or bottomland, the rate of flow is slow enough to permit the silt to settle. Finally, the water is left in quiet pools or marsh areas, from which it depoits the fine clay. Levees are characterized by good internal drainage during periods of low water, whereas the back swamp and marsh exhibit poor internal drainage (see Chapters on Drainage and Geomorphology).

Two orders of soil occur in South Central Louisiana. These are the Histosols (organic soils found in the wetlands) and the Inceptisols (moist soils found along the drainage ways). The suborders most typically found in this region include: H2-Saprists, made up of decomposed mucks; and I2-Aquepts, seasonally saturated with water. The Saprists are generally good for truck crops if drained, but are usually left idle when undrained. The Aquepts are gently sloping and if drained, support most raw crops including corn, soybeans, sugarcane and cotton. If left undrained, Aquepts soils are most commonly used as pasture or woodlands (Foth, 1972).

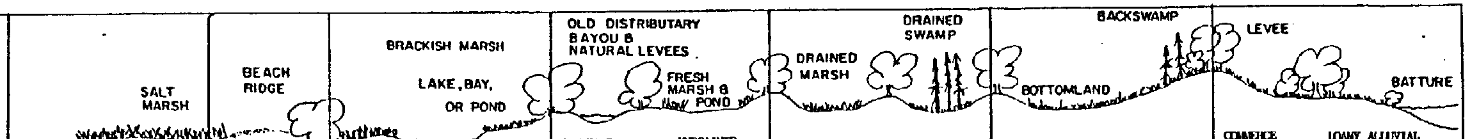
GENERAL SOIL TYPES

The general soil types and associations found in South Central Louisiana are distributed and controlled directly by the geomorphic features of the landscape. These natural features include: levees; backswamp; bottomland; drained swamp; drained marsh; fresh marsh and pond; old distributary bayous and natural levees; brackish marsh, lake, bay or pond; beach ridge; and salt marsh. Table 4.1 displays each soil association, its characteristics, suitability, degree of limitation, engineering characteristics, management, drainage factors and existing usage (Gagliano, 1973).

Figure 4.2 shows the distribution of these soil associations throughout South Central Louisiana. However, if one desires a more detailed study of the soils in our region, the U. S. Soil Conservation Service has soil surveys for five of our parishes, excluding St. Charles.

In conclusion, much consideration must be given to the soils located in South Central Louisiana, their distribution and properties, when guiding future development. Characteristics such as bearing capacity, shrink/swell potential under modified ground water levels, and trafficability place distinct constraints on the expansion of urban type development. When ignored, development may either fail as manifested in a number of reclamation projects or result in unwanted maintenance and flood protection requirements (Gagliano, 1972).

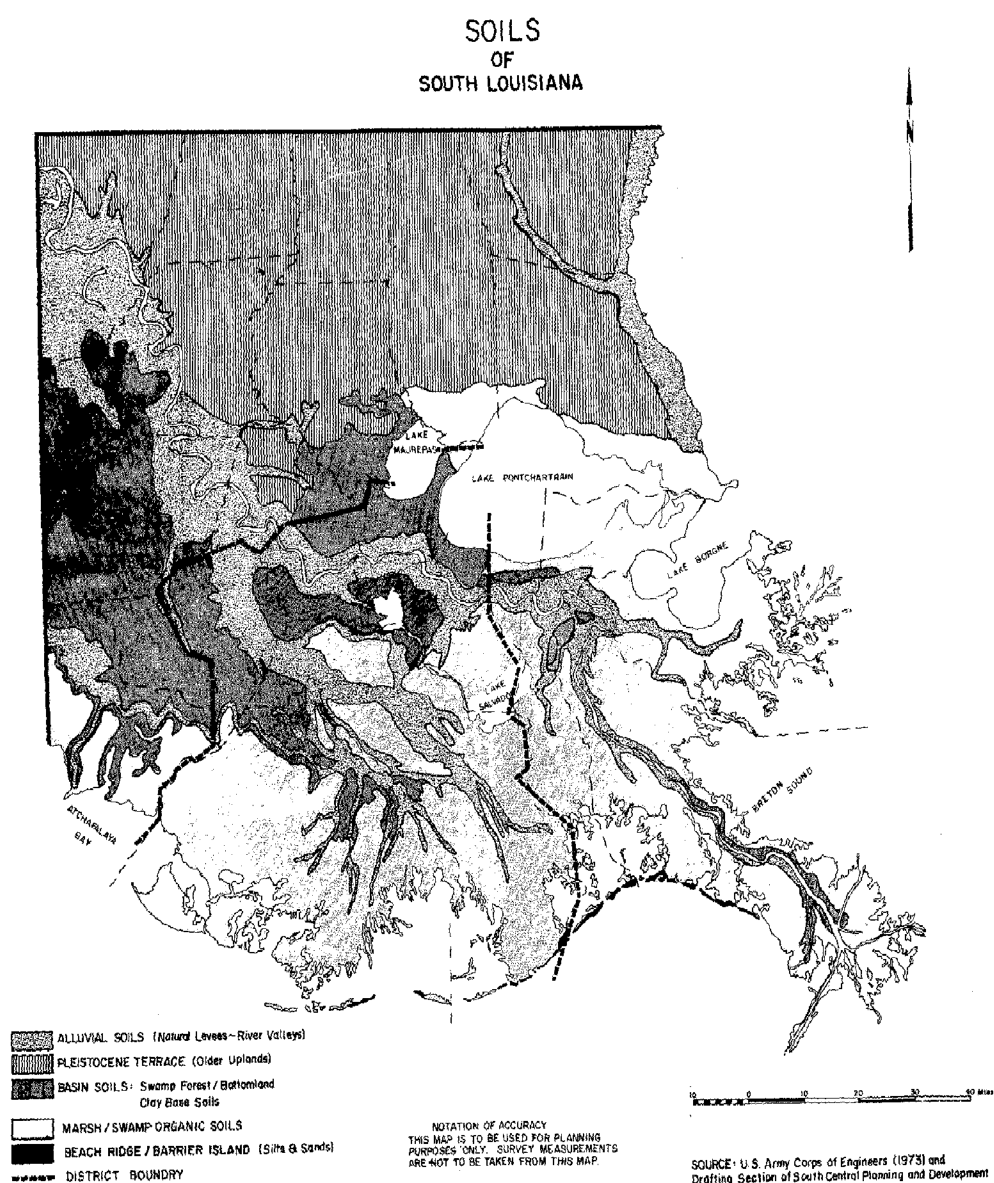
TABLE 4.I



SOILS	SALT MARSH	BEACH RIDGE	BRACKISH MARSH / LAKE, BAY, OR POND	OLD DISTRIBUTARY BAYOU & NATURAL LEVEES	FRESH MARSH & POND	DRAINED MARSH	DRAINED SWAMP	BOTTOMLAND	BACKSWAMP	LEVEE	BATTURE
SOIL ASSOCIATION	UNDRAINED SALTWATER MARSH	SAND	BRACKISH MARSH	COMMERCE GYPREMORT CONVENT mhoon baldwin iberia	UNDRAINED FRESHWATER MARSH gallion sharkey dundee	DRAINED FRESH/SALT MARSH	DRAINED SWAMP	UNDRAINED SWAMP	SHARKEY SWAMP tunica baldwin barbary maurepas	COMMERCE GYPREMORT CONVENT mhoon baldwin iberia	LOAMY ALLUVIAL convent-silty convent-loamy alluvial
GENERAL SOIL CHARACTERISTICS	Organic layer of various thicknesses underlain by soft dispersed saline clays and mucky clays with separation when flooded: peat or muck underlain by slightly firm to semi-fluid clays and some fine sands. permanently high water table	fine sand mixed with shell fragments	unstable organic material of varying thicknesses underlain by silty clays with separation when flooded. permanently high water table	silt loam surface silt clay loam sub-soil permanently high water table	unstable: organic material several feet thick, underlain by silty clays with separation when flooded: black organic material 2-8' thick over soft clay: some flotation.	organic material several feet thick, underlain by clay: some thin loamy fill material.	thin organic surface underlain by clay, with some 1-several feet thick positions loamy fill.	thin organic surface underlain by clay: with spots of thick organic material: organic surface layer 1 to several feet thick over firm semi-fluid clays. Permanent high water table	clay surface and subsoil underlain below 25" by loam: flooded most of time: loamy fill.	silt loam surface: silt clay loam sub-soil	stratified silt loam very fine to fine loamy
SUITABILITY											
TOP SOIL	not suitable	not suitable	not suitable	good-fair	not suitable	not suitable	not suitable	not suitable	not suitable	good-fair	fair
HIGHWAY SUBGRADE	not suitable	fair	not suitable	fair-poor	not suitable	not suitable	not suitable	not suitable	not suitable	fair-poor	good-fair
HIGHWAY SUBBASE	not suitable	fair	not suitable	fair	not suitable	not suitable	not suitable	not suitable	not suitable	fair	fair
RESIDENTIAL FILL	not suitable	not suitable	not suitable	fair-poor	not suitable	not suitable	not suitable	not suitable	not suitable	fair-poor	fair
SAND OR SHELL (subsurface feature)	not suitable	good	not suitable	not suitable	not suitable	not suitable	not suitable	not suitable	not suitable	not suitable	good-fair
DEGREE OF LIMITATION											
HOMESITES (1-2 story)	very severe	severe	very severe	slight to moderate	very severe	severe	slight to severe	severe to very severe	very severe	slight to moderate	
LIMITED INDUSTRY (with community sewage system)	very severe	severe	very severe	moderate to severe	very severe	severe	slight to severe	severe to very severe	severe	moderate to severe	
LANDSCAPE-GARDENS-LANES	very severe	severe	very severe	slight to moderate	very severe	severe	slight to severe	severe to very severe	severe	slight to moderate	
PLAYGROUNDS-PICNIC AREAS	very severe	severe	very severe	moderate to severe	very severe	severe	slight to severe	severe to very severe	severe	moderate	
STREETS-ROADS-AIRPORT RUNWAYS	very severe	severe	very severe	moderate	very severe	severe	slight to severe	severe to very severe	severe	moderate	
CAMPSITES-GOLF FAIRWAYS	very severe	severe	very severe	slight to moderate	very severe	severe	slight to severe	severe to very severe	severe	slight to moderate	
ENGINEERING CHARACTERISTICS											
SUBSIDENCE POTENTIAL	high	low	high	low	high	very high		medium		low	
SHRINK-SWELL POTENTIAL	low to high	none	high	high	low - high	high		high	high	very - moderate	
BEARING STRENGTH (1-2 story buildings)	low - very low	high	low - very low	low	low - very low				low	low - moderate	
CORROSION POTENTIAL	high		high	high	high					moderate	
MANAGEMENT	ducks deer	seashore birds	ducks deer	catfish	deer ducks	ducks	ducks deer	deer ducks crawfish rabbits	deer ducks turkey squirrels quail	harbor facilities marine-type installations ducks, squirrels, rabbits, doves, quail	
DRAINAGE FACTORS	near sea level flooded - saline tidewaters	flooding	poorly drained near sea level	poorly drained wet to moderately wet	near sea level flooded	poorly drained	poorly drained	near sea level	poorly drained infrequent floods	slightly wet	
EXISTING USEAGE	wildlife habitat	bird santuary	wildlife recreation	residential, cultivated crops, urban, pasture, industrial	livestock, on stable areas	pasture/range sugarcane, urban industrial	urban, industrial woodland, being cleared	wildlife habitat	cropland, pasture, urban, industrial	recreational, residential, crops, urban, pasture, industrial, flood retention, woodland, wildlife, borrow fill	

SOURCE: GAGLIANO & VAN BEEK (1973)

FIGURE 4.1



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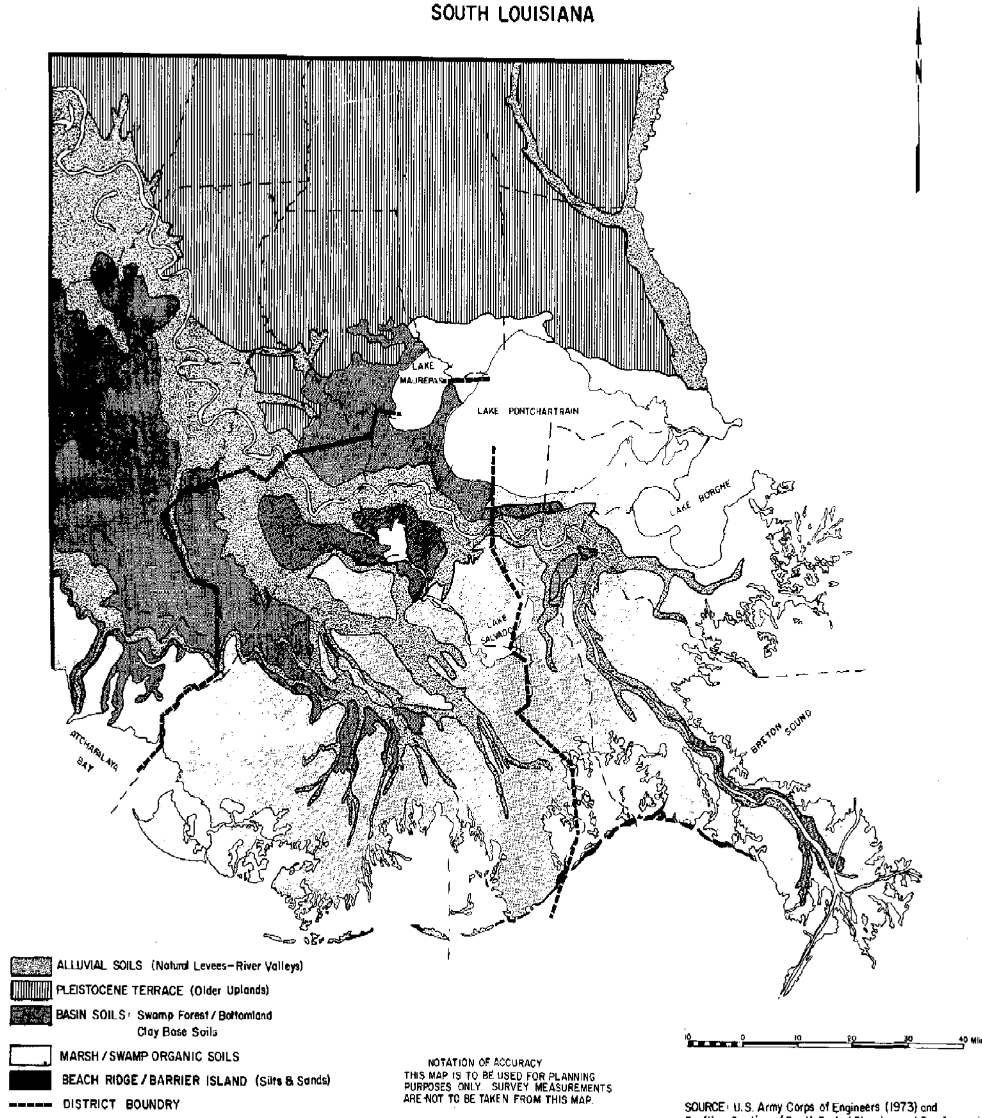
SOURCE: U.S. Army Corps of Engineers (1973) and Drafting Section of South Central Planning and Development Commission (1980)

FIGURE 4.1

SOILS
OF
SOUTH LOUISIANA



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SOURCE: U.S. Army Corps of Engineers (1973) and Drafting Section of South Central Planning and Development Commission (1980)

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CHAPTER 5 - NATURAL VEGETATION

By

Edwin J. Durabb

INTRODUCTION

Vegetation in the South Central District, like elsewhere, is influenced by the factors of geomorphology, soil type, elevation, wetness and climate. These processes, discussed in this report, have shaped the location and type of natural flora in the region.

The vegetation zones in the South Central District can be broken down into:

<u>Forested</u>	- 1. Natural Levee Vegetation
	- 2. Backswamp
<u>Non-Forested</u>	- 3. Fresh Water Marsh
	- 4. Brackish Marsh
	- 5. Saline Marsh
<u>Mixed</u>	- 6. Beach Ridges/Barrier Islands
	- 7. Spoil Banks

The following is a brief discussion of each general vegetation type within the district.

FORESTED AREAS

Natural Levee Vegetation

The natural levee vegetation is that characteristic of the higher, drier, alkaline, silty upland soils of the distributary system of the Mississippi Delta. The natural vegetation originally consisted of forest lands, usually hardwoods, mainly oak. The following were the dominant forms of vegetation on these surfaces (Detro and Davis, 1978):

1. Live Oak
2. Water Oak
3. Red Gum
4. American Elm
5. Honey Locust
6. Pecan

Due to the fertile nature of the soil, relatively good drainage, and lack of flooding except during the spring, this area was rapidly cleared and settled. Today, most of the population of the South Central District resides in these areas. The land has been cleared and farmed for sugarcane, soybeans and truck crops. Almost no hardwood forest that originally grew on the natural levees remain.

Backswamp

According to Bahr and Hebrard (1976), a swamp is:

> . . . a woody community occurring in an area where the soil is usually saturated or covered with water for one or more months of the growing season.

The vegetation in the swamp forest is characterized by tree growth, the type of which is dependent on the slight differences in elevation and soil type that govern the degree of standing water in the area.

The swamp forest flanks the natural levees and fills the inter-distributary basins limited only by soil type and salinity levels. This is largely an inundated fresh water region (see Chapter 7 for full discussions of the wetlands ecosystem).

Table 5.1 lists the dominant vegetation types and percentage of cover of the two main types of swamp forest vegetation. Type one forest occupies the wetter areas; type two the drier zones. This table is based on a survey in the Barataria Basin and may differ somewhat from other areas. However, the main species in the vegetation zone are more or less the same.

TABLE 5.1

Percentage Of Tree Species In Cypress-Tupelo Gum Swamp

And Bottomland Hardwood Forest Of The Barataria Basin

Cypress-Tupelo Gum Swamp	
Taxodium distichum (Cypress)	33.33
Nyssa Aquatica (Tupelo gum)	32.41
Acer Drummondii (Swamp maple)	19.44
Fraxinus tomentosa (Pumpkin ash)	8.33
Bottomland Hardwood Forest	
Acer drummondii (Swamp maple)	25.00
Nyssa Aquatica (Tupelo gum)	11.43
Acer negundo (Boxelder)	7.86
Populus heterophylla (Cottonwood)	2.86
Taxodium distichum (Cypress)	4.29
Cornus drummondii (Roughleaf dogwood)	8.57
Salix nigra (Black willow)	5.71
Ulmus americana (American elm)	5.00
Carya ovata (Shagbark hickory)	4.29
Fraxinus tomentosa (Pumpkin ash)	3.57
Quercus nigra (Water oak)	2.14
Celtis laevigata (Hackberry)	2.14
Diospyros virginiana (Persimmon)	3.57
Ilex decidua (Deciduous holly)	2.86
Quercus shumardii (Shumard red oak)	2.14

Source: Bahr and Hebrard (1976): 16.

NON-FORESTED AREAS

Marsh Vegetation

Marshland has been defined as:

> . . . a periodically flood zone characterized by primarily nonwoody vascular plants.
>
> Bahr and Hebrard (1976): 23.

This vegetation type makes up the bulk of the land cover in Terrebonne and Lafourche Parishes and significant areas in St. Charles (Louisiana State Planning Office, 1975). These wet grassland areas are generally poorly defined and tend to merge into each other rather than exhibit sharp contrasts between zones. Soil structure and salinity define the marsh forest contact zone. Water salinity concentrations and the resultant vegetation types are used to delineate the three classifications of Fresh, Brackish and Saline marsh. The following is a discussion of each marsh type.

Fresh Water Marsh

Fresh marsh is characterized by the most diverse plant communities of all, the marsh units. It is also the most ambiguously defined area. Much of this zone is represented by a phenomenon known as "flotant marsh":

> Flotant consists of a dense mat of vegetation supported by detritus several feet thick, which is held together by a matrix of living roots. This floating marsh is indistinguishable from true wetland until trod upon and extends from the shoreline of a lake into the lake itself. Eventually, as the bottom sediments and the floting layer each accumulate more material, they merge to form a new shoreline and the lake shrinks in size.
>
> Bahr and Hebrard (1976): 24.

Fresh marsh vegetation cover often occurs over huge areas of peaty deposits. The soil mix is often sixty-five percent organic and thirty-three percent clay.(see Chapter 4). Representative plant species are listed in Table 5.2.

TABLE 5.2

Percentage of Plant Species

In Fresh Marsh Portions of Barataria Basin

Panicum hemitomon (Maidencane)	41.35
Sagittaria falcata (Bulltongue)	17.42
Eleocharis sp. (Spike rush)	12.31
Alternanthera philoxeroides (Aligator -weed)	3.43
Cyperus odoratus (Sedge)	3.21
Typha spp. (Cattail)	2.59
Echinochloa walteri (Water millet)	2.15
Eichornia crassipes (Water hyacinth)	1.99
Bacopa monnieri (Water hyssop)	1.82
Polygonum sp. (Smartweed)	1.60
Scirpus olneyi (Three-cornered grass)	1.48
Zizaniopsis miliacea (Giant cutgrass)	1.36

Source: Bahr and Hebrard (1976): 25.

Brackish Marsh

Brackish marsh is the area between the fresh and saline marshes in the coastal estuarine system. This zone is extremely important ecologically, as it provides a vital link in the estuarine salinity, water flow and flood chain systems. The brackish marsh system represents the first marsh unit strongly influenced by tidal effects. This area also receives freshwater runoff from other units as well. (Bahr and Hebrard , 1976) have stated that aquatic areas that are the most stable, i.e. unvarying with respect to their physical characteristics, especially salinity and temperature, are more likely to show greater specie diversity than areas of rapid change. Therefore, this area has somewhat less plant variety than fresh marsh. Table 5.3 illustrates the typical plant community of a brackish marsh.

This type of marsh is the first vegetation zone that meets commonly accepted definitions of estuary. Two of the definitions are:

> An estuary is any confined coastal water body with an open connection to the sea and a measurable quantity of salt in its waters.
>
> Clark (1975): 1.
>
> Estuaries are defined as inland bodies of water intermediate between fresh and saline systems and therefore mixing zones.
>
> Bahr and Hebrard (1976): 34.

Since the brackish unit is covered with water with measurable salinity content, it marks the beginning of the transition between freshwater and marine environments (see Chapter 7 for a discussion of the Wetlands Ecosystem).

Soils in this unit have as little as 16 - 30 percent clay content and have the highest level of organic content of any marsh unit (see Chapter 4).

TABLE 5.3

Percentage of Plant Species

In Brackish Marsh Areas of Barataria Basin

Spartina patens (Wire grass)	45.84
Distichlis spicata (Salt grass)	28.96
Spartina alterniflora (Oyster grass)	9.03
Eleocharis parvula (Dwarf spikerush)	5.49
Juncus romerianus (Black rush)	3.26
Scirpus olneyi (Three-cornered grass)	1.26

Source: Bahr and Hebrard (1976): 36.

Saline Marsh

Saline marsh has been characterized by Bahr and Hebrard (1976) as in a declining state, i.e. in transition between wetland and open water. The area that is now saline marsh in the South Central Region was at one time brackish or possibly even fresh during the period when delta building and large quantities of freshwater and sediment were introduced into this zone. The waters of this zone are almost marine with a diurnal tide range. Hurricane storm surges and waves affect this area hardest causing considerable land loss by erosion. The only protection this area has is the barrier islands and beach ridges that provide partial shelter from wave energy.

As in the other marsh types, organic levels in the soil are high, but not as high as brackish and fresh marsh. The remainder of the soil is usually fine clay.

Species diversity is low and confined to those plants tolerant of high salinity. Table 5.4 lists the primary vegetation types in this zone.

TABLE 5.4

Percentage of Plant Species In The

Saline Marsh Region of Barataria Basin

Spartina alterniflora (Oystergrass)	62.79
Juncus romerianus (Black rush)	14.90
Distichlis spicata (Salt grass)	10.05
Spartina patens (Wire grass)	7.77

Source: Bahr and Hebrard (1976):

MIXED AREAS

Beach Ridges/Barrier Islands

Barrier islands and beach ridges present a unique and varied habitat ranging from marsh to upland forest vegetation zones. Plant species are too numerous to mention here. The following is a brief listing of habitat zones common on Louisiana barrier islands (Bahr and Hebrard 1976).

1. Salt marsh habitat (along leeward edge of island).
2. High marsh (transition marsh located on higher ground).
3. Forest (located on highest ground only on larger islands with vegetation resembling that of the natural levee forest.
4. Meadow habitat (located toward the Gulf next to the wooded area).
5. Dune habitat (located in the area close to the Gulf capable of supporting rooted vegetation).
6. Mangrove - (tree vegetation in coastal Louisiana confined to a Low Bush commonly found only along the coast (limited by intolerance of cold weather.

Spoil Banks

Due to the numerous canals dug for navigation and oil and gas exploration, there exists many long ridges parallel to these canal borders of dredged sediment called "spoil banks". Soils on these banks can be of any type and the vegetation is dependent on the age of the spoil bank, soil type and height of the ridge. The most common vegetation, woody and nonwoody, are listed in Table 5.5.

Table 5.5

Plant Species Composition Of Spoil Banks

And Natural Levees in Coastal Louisiana

Baccharis sp. (Groundsel tree)

Iva frutescens (Marsh elder)

Cynodon dactylon (Bermuda grass)

Spartina patens (Marshhay cordgrass)

Distichlis spicata

Phragmites communis (Roseau cane)

Rubus sp. (Blackberry)

Trees (when present)

   Salix nigra (Black willow)

   Sapium sebiferum (Tallow tree)

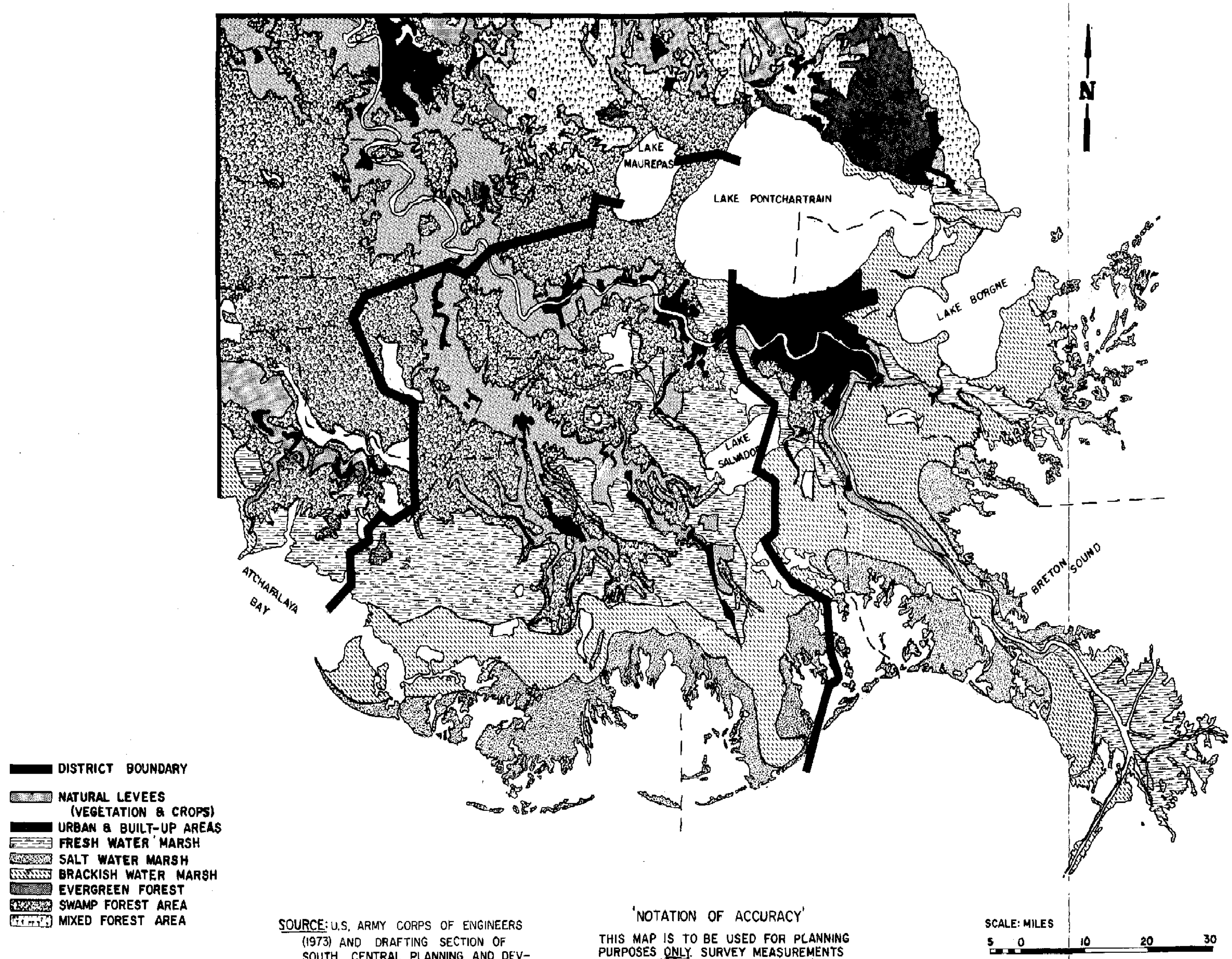
Source: Bahr and Hebrard (1976): 63.

SUMMARY

The vegetation of the South Central Area has developed in response to deltaic deposited sediment, subsidence, erosion, climate and estuary development. Figure 5.1 illustrates the location of the main vegetation zones in the South Central Area. It should be noted that, for clarity sake, all marsh units and spoil bank vegetation are not shown.

VEGETATION OF SOUTH LOUISIANA

FIGURE 5.1



SOURCE: U.S. ARMY CORPS OF ENGINEERS (1973) AND DRAFTING SECTION OF SOUTH CENTRAL PLANNING AND DEVELOPMENT COMMISSION (1980).

'NOTATION OF ACCURACY'

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CHAPTER 6 - DRAINAGE AND GROUNDWATER RESOURCES

By

Edwin J. Durabb

INTRODUCTION

Water and water flow patterns are of prime concern in this area due to the low land elevations and constant flood threat from rivers and the Gulf of Mexico. The patterns of drainage and water distribution are determined by five main factors:

1. Local Geomorphology
2. External Influx of Freshwater
3. Rainfall
4. Ocean Tidal Waters
5. Man-made Alterations.

Local Geomorphology shapes the flows of water in the basin. This topic is discussed in detail in Chapter 3. External Influx of Freshwater into the district occurs from the Mississippi River distributary system and drainage off of the higher Pleistocene terraces to the north of the district. Rainfall currently provides the majority of the freshwater supply in the estuarine drainage basins since man-made levees have limited Mississippi River water input (see Chapter 1). Ocean Tidal Waters flow into all basin areas from the Gulf of Mexico causing the conditions in the basins to be labeled estuarine. Finally, Man-made Alterations such as canals and levees have changed water flow patterns in the area (see Part II, Chapter 5 for further discussion).

Groundwater in the district occurs mainly in shallow aquifers and is not suitable for large scale use. Salt water is a problem for water supplies as one approaches the coast. A full discussion of drainage patterns and groundwater is presented in the basin descriptions that follow.

DRAINAGE BASINS

Data collected by the Louisiana 208 Water Quality Program has enabled the South Central District to be separated into four main basins:

1. Terrebonne
2. Barataria
3. Pontchartrain
4. Lower Mississippi.

None of these basins lie entirely within the South Central District (see Figure 6.1). The following is a discussion of each of the drainage and groundwater characteristics of these major drainage basins.

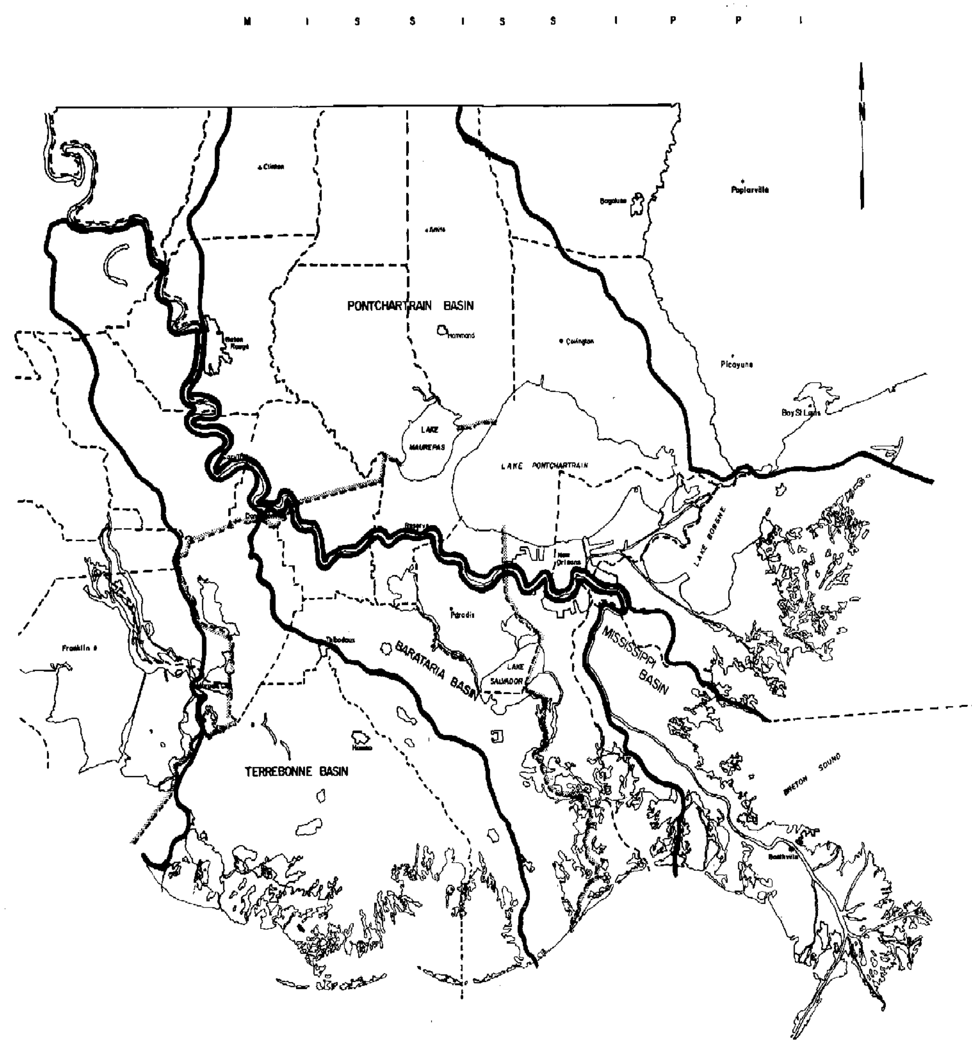
Lake Pontchartrain Basin

Physical Description

Basin Boundaries

The State of Louisiana has been divided into twelve major drainage basins for the purpose of water quality management planning. The Lake Pontchartrain Basin is located in southeastern Louisiana as shown in Figure 6.1. The basin is bound by the Mississippi State Line on the north, the Mississippi River east bank levee on the west, the drainage divide on the Pearl River Basin on the east, and the Mississippi Sound on the south.

FIGURE 6.1



BASIN BOUNDARY
DISTRICT BOUNDARY

SOURCE: LA. WILDLIFE AND FISHERIES COMMISSION (1969)

SCALE 1:500,000

DRAINAGE BASINS

"NOTATION OF ACCURACY"
THIS MAP IS TO BE USED FOR PLANNING PURPOSES ONLY. SURVEY MEASUREMENTS ARE NOT TO BE MADE FROM THIS MAP.

Hydrology - Surface Water

The Lake Pontchartrain Basin consists of the tributaries and distributaries of Lake Pontchartrain. Lake Pontchartrain is a brackish natural lake and has tributary drainage area of approximately 4,900 square miles. Most of this basin lies north and east of the South Central District. Only the northern portion of St. James, St. John and St. Charles Parishes are within the basin boundaries.

Major tributaries draining into Lake Pontchartrain are the Tangipahoa and Tchefuncte Rivers, Lake Maurepas, and Bayou Lacombe, Bonfouca, and Castine. The Bonnet Carre Spillway serves as an intermittent source of inflow when used for flood control on the Mississippi River. The drainage systems of Jefferson and Orleans Parishes discharge storm flows into the lake on the south shore. Tributaries discharging into Lake Maurepas include the Blind, Amite, and Tickfaw Rivers. Pass Manchac links Lake Maurepas to Lake Pontchartrain.

The Rigolets and Chef Menteur Pass are natural distributaries on Lake Pontchartrain which discharge to Lake Borgne. The Inner Harbor Navigation Canal, the Intracoastal Waterway, and the Mississippi River Gulf Outlet are man-made navigable waterways that inter-link the Mississippi River, the Gulf of Mexico and Lake Pontchartrain for commercial shipping operations.

The Louisiana Stream Control Commission has divided the Lake Pontchartrain Basin into sixteen stream segments. Each designated segment represents the drainage area of a particular watershed. Table 6.1 outlines the stream segments in the Lake Pontchartrain Basin.

TABLE 6.1

Lake Pontchartrain Basin

Stream Segment Description

Comite River from Mississippi state line to the Amite River including all tributaries.

Bayou Manchac to confluence with Amite River, including Dawson Creek, Ward Creek, Bayou Braud and all other tributaries.

Amite River from Mississippi state line to Lake Maurepas including all tributaries to Lake Maurepas.

* Bayou Conway, Bayou Black, and Blind River and related tributaries to Lake Maurepas.

Tickfaw River from Mississippi state line to Lake Maurepas including Ponchatoula Creek, Natalbany River and all other tributaries.

* Lake Maurepas and tributaries including Pass Manchac.

Tangipahoa River from the Mississippi state line to Lake Pontchartrain including all tributaries.

Tchefuncte River from headwaters to Lake Pontchartrain including Bogue Falaya River and all other tributaries.

Bayou Lacombe from headwaters to Lake Pontchartrain including tributaries and related watershed.

Bayou Bonfouca from headwaters to Lake Pontchartrain including tributaries and related watershed.

* Lake Pontchartrain including minor tributaries; Bayous Castine, Chinchuba, and Cane.

Lake Catherine, Rigolets and Chef Menteur Pass and ancillary waterbodies including Intracoastal Waterway from Chef Menteur to Rigolets Pass.

Inner Harbor Navigation Canal from Mississippi River to Lake Pontchartrain.

East/West Intracoastal Waterway from Inner Harbor Navigation Canal to Chef Menteur Pass.

Mississippi River Gulf Outlet from Intracoastal Waterway to Breton Sound and tributaries including Bayou Bienvenue and Bayou Dupre.

Coastal waters of Lake Pontchartrain Basin including Lake Borgne, Mississippi Sound, and numerous lakes and embayments in the control marshes of St. Bernard Parish.

Source: Stanley Consultants (1979) page 2, 3.

* Partly within South Central District.

Groundwater

Groundwater is confined within late Quaternary (Recent and Pleistocene), early Quaternary (Pilocene), and Tertiary (Miocene) deposits to minus 2,000 feet MSL or more. Almost all groundwater wells north of Lake Pontchartrain exhibit artesian behavior because of the confining sand and clay subsurface strata. Water-bearing sands at various depths have been differentiated and are denoted by aquifer depth, for example, "the 400 foot sands". Most aquifers are connected hydraulically and movement of groundwater occurs rapidly within aquifers and to some extent among aquifers. This movement is primarily horizontal and down dip due to the impermeable nature of the intervening clay layers.

Miocene deposits are recharged north of the study area where outcrops occur. Some Pilocene aquifer recharge occurs in upland outcrops within the study area, but this activity is limited to elevated upland areas with moderately permeable soil and subsoil layers. The younger alluvial aquifers are recharged by rainfall, artesian discharge of underlying, older groundwater deposits, and to some extent by fluvial recharge during high river stages. This activity is particularly evident with the Mississippi River alluvial valley shallow aquifers. With increasing inland elevation, fluvial recharge is the dominant recharge mechanism, and groundwater flow is primarily towards stream beds where it provides a portion of the base flow of the uplands rivers (Stanley Consultants, 1979).

Almost all of the productive groundwater areas in this basin are located north of the South Central District. Only the northern portion of St. John Parish has sufficient reserves of groundwater used for municipal use at this time (see Table 6.7 for sources of water usage in South Central Planning & Development Commission District.

Terrebonne Basin

Physical Description

Basin Boundaries

The Terrebonne Basin (Figure 6.1) covers an area extending from New Roads and Morganza in the north to the Gulf of Mexico in the south and from Port Allen and Golden Meadow in the east to Morgan City in the west. It is approximately 120 miles long and varies from about 16 to 72 miles in width. The Mississippi River is the northern boundary, Bayou Lafourche and the Mississippi River are the eastern boundaries, the Gulf of Mexico is the southern boundary, and the East Atchafalaya Basin Protection Levee and the Intracoastal Waterway form the western boundary. This encompasses over 1,750 square miles, including all of Terrebonne Parish and portions of Pointe Coupee, West Baton Rouge, Iberville, Assumption, Ascension, St. Martin, St. Mary, Iberia and Lafourche Parishes.

Basin Hydrology - Surface Water

Surface water areas within the Terrebonne Basin comprise a complex combination of interconnecting rivers, lakes, bayous and canals. Most of this surface water is found in the southern half of the basin where coastal marsh and estuarine regions prevail.

A table of stream segments can be found in Table 6.2. Major rivers and lakes are listed in Table 6.3 and Table 6.4, respectively. Navigable canals throughout the basin are numerous, the largest of which include the Intracoastal Waterway, the Port Allen to Morgan City Intracoastal Waterway and the Houma Navigation Canal.

The Intracoastal Waterway has a project depth of 12 feet, is 125 feet wide and stretches 1,115 miles from Brownsville, Texas to Apalachicola, Florida, of which approximately 65 miles lie within the Terrebonne Basin between Morgan City and Larose.

The Port Allen to Morgan City Intracoastal Waterway connects the 2 cities and is 12 feet deep and 125 feet wide.

The Houma Navigation Canal runs 16 miles southward from the Intracoastal Waterway at Houma and then southeasterly for 10.5 miles to the Terrebonne Bay. The canal has a project depth of 15 feet and extends to a width of 150 feet.

Surface water flow over the basin is generally toward the Gulf. The shallowness of most of the water, particularly in the southern and coastal regions of the basin, creates flow conditions which are highly susceptible to tidal and aeolian (wind) influences. A combination of tidal factors and southerly winds, for example, may produce conditions of no flow, and in some instances even a northerly flow. Interconnections between shallow bodies of water (bayous, canals, bays, marshland and estuarine areas) result in a different flow pattern for each set of wind, tide and rainfall conditions. During hurricanes, water can move inland in vast quantities, endangering both life and property.

TABLE 6.2

Terrebonne Basin

Stream Segment Description

Lower Grand River watershed from headwaters to Bayou Sorrell Lock including Bayou Grosse Tete and False River Lake and other tributaries.
Terrebonne Basin above Bayou Black Ridge and Little Bayou Black Ridge including Grand River, Belle River, Lake Verrett, Lake Palourde and Lake Bayou Black and tributaries.
Terrebonne Basin above Bayou Blue Ridge including E/W Intracoastal Waterway from Houma to Larose, Bayou Blue, Bayou Grand Coteau and tributaries.
Bayou Lafourche from Donaldsonville to Larose.
West Terrebonne coastal zone south and west of Bayou Black Ridge and Bayou du Large Ridge including E/W Intracoastal Waterway from Bayou Boeuf to Houma, Lake De Cade, Lake Merchant, Bayou Junop and adjacent coastal waters.
Middle Terrebonne coastal zone between Bayou du Large Ridge and Bayou Terrebonne Ridge including Bayou Grand Caillou, Houma Navigational Canal, Bayou Petit Caillou, Bayou Terrebonne and Lake Pelto and adjacent coastal waters except Segment 1213.
Estuarine area south of Lake Boudreaux bounded by Houma Navigation Canal, Bay Long, Bay Lucien and Bayou Terrebonne.
East Terrebonne coastal zone between Bayou Blue Ridge and Bayou Lafourche Ridge including Bayou Barre, Lake Barre, Bayou Jean La Croix, Lake Felicity and Bayou Blue, Lake Raccourei and Timbalier Bay and adjacent coastal waters.

Source: URS/Forrest and Cotton, Inc. (1979) page 2.

TABLE 6.3

Terrebonne Basin Major Rivers

Name	Length in Miles (approximate)
Bayou Grosse Tete	30
Choctaw Bayou	10
Grand River	25
Belle River	10
Bayou Blue	20
Bayou Grand Coteau	N.D.A.
Bayou Lafourche	100
Bayou Carencro	25
Bayou du Large	25
Bayou Black	30
Bayou Grand Caillou	25
Bayou Petit Caillou	30
Bayou Terrebonne	45
Grand Bayou	20
Bayou Penchant	25

Source: URS/Forrest and Cotton, Inc. (1979) page 14.

TABLE 6.4

Terrebonne Basin Major Lakes

Name	Surface Area (Sq. Miles)
False River Lake	4.6
Lake Natchez	---
Lake Verrett	22
Grassy Lake	1.6
Lake Palourde	18
Lake Bayou Black	---
Lake Fields	3.3
Long Lake	1.3
Lake Cocodrie	0.7
Lake Hackberry	1.9
Lake Hatch	0.3
Lake Theriot	2.2
Lake de Cade	7.6
Carencro	---
Lost Lake	6.5
Lake Mechant	13.4
Fourleague Bay	---
Lake Penchant	1.3
Caillou Lake	---
Lake Boudreaux	6.7
Lake Pelto	---
Carrion Crow Lake	1.3
Dog Lake	1.3
Fiddlers Lake	0.92
Lake Gero	0.8
Mud Lake	2.2
Lake Pagie	0.90
Lake Tambour	---
Catfish Lake	2.4
Lake Felicity	---
Lake Barre	---
Lake Raccourci	6.5
Little Lake	---
Old Lady Lake	---
Wonder Lake	0.92

Source: URS/Forrest and Cotton, Inc., (1979) page 15.

Salinities in the coastal region range from that of sea water, through brackish, to fresh. These conditions result from freshwater flowing from the north, meeting saltwater. Streams may or may not be stratified and may vary with time from fresh to very salty at a single location.

Groundwater

Freshwater aquifers within the Terrebonne Basin originate from Quaternary, Pliocene and Miocene deposits. Of these water bearing deposits, the Miocene are the deepest (up to 3,500 feet below sea level) while the Quaternary are the shallowest (up to 1,000 feet below sea level).

Deposits within the Miocene and Pliocene(MioPliocene) zones make up the Mio-Pliocene aquifer. Sands within this aquifer are uniformly graded with coefficients of permeability generally within the range of 250 to 1,000 gallons per minute, per square foot. Variation in sand thickness and continuity result in a wide range for coefficients of transmissibility (usually between 100,000 to 300,000 gallons per minute, per square foot). Well yeilds as high as 1,000 to 3,000 gallons per minute are possible in most areas, with even higher well yields possible where screening of all or nearly all available sands is implemented. Water in the Mio-Pliocene aquifer is generally soft. Dissolved solids content (associated with sodium chloride) increase southward where saltwater intrusion becomes significant.

Aquifers associated with the Quaternary deposits include the Pleistocene aquifer and the Mississippi River Valley Alluvial aquifer. The Pleistocene aquifer overlies the Mio-Pliocene deposits and consists of poorly sorted sands ranging from fine to coarse and graveliferous. Sand thicknesses vary, permeability is limited and coefficients of transmissibility are generally less than 200,000 gallons per minute, per square foot. Well yields are low to moderate. Water is generally soft and low in dissolved solids content, except in the southern downdip where saltwater intrusion may be significant.

The Mississippi River Valley Alluvial aquifer is contiguous with the Pleistocene aquifer and also in hydraulic contact with the Mississippi River. The very fine sand to gravel deposits are highly variable in thickness and range from less than 50 feet to more than 250 feet. Coefficients of permeability range from less than 500 to more than 3,000 gallons per minute per square foot, and coefficients of transmissibility extend from 40,000 to about 600,000 gallons per minute per square foot. The aquifer possesses the greatest potential for further development with well yields as high as 6,000 gallons per minute. Water is generally hard and high in iron content.

Large quantities of groundwater are available throughout the basin for both industrial and domestic use. The use of this groundwater, however, is significantly affected by its quality, which varies greatly because of vast amounts of brackish and saline waters within the basin.

In general, aquifers from Quaternary, Pliocene and Miocene deposits north of the 30° latitude have no major groundwater problems and commonly yield more than 1,000 gallons per minute of fresh water suitable for domestic use. Heavy industrial withdrawals in the Baton Rouge area, however, have resulted in a decline of water levels by 100 to 200 feet or more in the West Baton Rouge and southeastern Pointe Coupee parishes and have increased the potential of contamination from saltwater encroachment.

South of the 30° latitude, groundwater sources are found in Quaternary deposits alone and range from brackish to saline. Much of this water is suitable for little else but industrial cooling. Sufficient quantities of fresh groundwater for domestic and industrial use are difficult to obtain with the exception of isolated layers or lenses from which pumping must carefully be controlled to prevent saltwater encroachment. The portions of the Terrebonne Basin within the South Central District fall into this category (see Table 6.7 for water usage in the South Central District).

Basin Description Source: URS Forest and Cotton, Inc (1979).

Barataria Basin

Basin Description

Basin Boundaries

The Barataria Bay Basin is bounded on the west by Bayou Lafourche, on the north by the Lower Mississippi River Basin, on the east by the Lower Mississippi River Basin and on the south by the Gulf of Mexico. Figure 6.1 shows a statewide vicinity map as well as the basin map.

There are no parishes that lie entirely within the basin boundaries. The basin is comprised of land areas from Plaquemines, Jefferson, St. Charles, Orleans, St. John the Baptist, St. James, Ascension, Assumption and Lafourche Parishes.

In general, the basin extends from latitude 30^{o} - 10' N to 28^{o} - 55' N and from longitude 91^{o} - 00' W to 89^{o} - 45' W.

Basin Hydrology

The dominant bodies of water in the basin are Lac Des Allemands, Lakes Cataouatche and Salvador, and Barataria and Caminada Bays. A majority of the basin is traversed by numerous bayous, canals and channels. The hydrology of the basin is greatly effected by the fact that the elevation of most of the land in this basin is at, just below or just above sea level. The tidal influence from the Gulf of Mexico is evident as far north as Bayou Des Allemands at the town of Des Allemands.

Lac Des Allemands is a large lake about twenty-three square miles of surface area located in the northern part of the basin. A large area of swamp land is drained by several bayous including Grand Bayou and Bayou Chevreuil that flow into this lake. Lac Des Allemands is drained to the southeast by Bayou Des Allemands which runs to Lake Salvador. Lac Des Allemands is shallow throughout, averaging about five feet.

Lakes Cataouatche and Salvador are located about ten miles southwest of New Orleans. The lakes are, for all practical purposes, one body of water being separated only by Couba Island. The lakes are fed by numerous bayous, including the large Bayou Des Allemands which enter the northwest corner of Lake Salvador, and drain into the Gulf of Mexico through Little Lake and Barataria Bay. The surface area of Lakes Cataouatche and Salvador is 84.5 square miles. Both are shallow, averaging about five feet. Water quality is quite variable due to the influx of brackish water from the Gulf of Mexico during high tides and fresh water during periods of high runoff. Both lakes are brackish at times and the water sometimes exceeds the chloride concentration recommended for domestic usage. Due to the shallowness and industrial boat traffic connected with oil fields in Lake Salvador, the lakes are usually muddy..

The Intracoastal Waterway crosses Barataria Basin just south of Lake Salvador. It is connected to the Mississippi River on the east by Algiers and the Harvey locks and to Bayou Lafourche on the west by the lock at Larose. A significant amount of fresh water enters the basins through these locks since both the Mississippi River and Bayou Lafourche have higher water surface elevations than the Intracoastal Canal.

The waters south of the Intracoastal Canal are estuarine in nature. Barataria Bay is connected to the Gulf of Mexico by Barataria Pass, Quatre Bayoux Pass and Abel Pass, and Caminada Bay is connected to the Gulf of Caminada Pass. These bays are connected to Little Lake and the Intracoastal Canal by several waterways including Bayou Perot and Bayou Barataria.

Groundwater

Groundwater in the Barataria Basin is generally derived in large quantities from strata that is chiefly sand and gravel interbedded with clay. Large groundwater supplies are obtained from alluvial gravels. Saltwater intrusion into the coastal aquifers can be a problem during excessive pumping and/or high tides. Most of the water quality is such that there is little or no potential use for municipal water supplies (see Table 6.7 for groundwater usage in this basin).

Basin Description Source: Water Resource Engineers (1979).

Lower Mississippi Basin

Physical Description

Basin Boundary

The Lower Mississippi River Basin, below the Old River control structure, is bound on the north by the Mississippi state line, on the east by the Lake Pontchartrain Basin and the levee crest; and on the west and south by the crest of the levee of the Mississippi River from the Mississippi state line to Donaldsonville, Louisiana, as shown in Figure 6.1. From Donaldsonville, Louisiana to the mouth of the river, the basin is bound on the west and south by the levee crest and the Barataria Bay Basin. The boundary of the lower Mississippi River Basin at its southern end is the Gulf of Mexico. Portions of the following parishes are located within the basin as described in Table 6.5.

TABLE 6.5

Parishes In Lower Mississippi Basin

Pointe Coupee	Iberville	St. Charles
West Baton Rouge	Ascension	Jefferson
West Feliciana	St. James	Orleans
East Baton Rouge	St. John the Baptist	Plaquemines

The Mississippi River drains over forty (40) percent of the continental United States. The major tributaries are shown in Table 6.6.

TABLE 6.6

Mississippi River Drainage Basin: Major Tributaries

Tributary	Drainage Area (square miles)	Average Discharge (cfs)	Unit Discharge (cfs/sq. miles)
Missouri R	529,000	70,100	0.13
Ohio R	203,900	255,000	1.25
Arkansas R	160,500	45,200	0.28
Red R	91,400	57,300	0.63

Source: Stanley Consultants (1979) pages 21, 24.

A history of disastrous floods and the projection that the Lower Mississippi River would change its course provided the impetus for construction of an extensive complex of levees, control structures, and floodways which regulate the high and low flows. The structures limit flow from the Mississippi River entering Old River, a branch channel at river mile 314.7, except under flood conditions and provide distributaries, namely the Atchafalaya Basin Floodway and Bonnet Carre Spillway, or flood waters. Under normal river flow conditions the control structures of the Morganza Floodway, the West Atchafalaya Floodway, and the Bonnet Carre Spillway remain closed. The control structure at Old River, which is located between Vicksburg (RM 435) and Target Landing (RM 306.6), diverts approximately twenty-five percent of the water from the main stem. The actual percentage diverted is dependent on discharges and stages in both the Mississippi River and the Red River-Old River Complex.

Under design flood conditions of a discharge of 2,720,000 cubic feet per second at Vicksburg and 350,000 cubic feet per second in the Red River, the distributaries and main stem of the river have the following capacities (which effectively provide the upper limit for maximum flow in the Lower Mississippi River):

Old River	620, 000 cfs
West Atchafalaya Floodway	250,000 cfs
Atchafalaya River	680,000 cfs
Morganza Floodway	600,000 cfs
Atchafalaya Basin Floodway	1,500,000 cfs
Mississippi River between the Morganza Floodway and the Bonnet Carre Spillway	1,500,000 cfs
*Bonnet Carre Spillway	250,000 cfs
Mississippi River below Bonnet Carre Spillway	1,250,000 cfs

* Located in SCP&DC District.

In the Lower Mississippi Basin, levees prevent flow from entering the river from both sides of the river except for an area of 855 square miles drained by Tunica Bayou, Bayou Sara, Thompson Creek, and Bayou Baton Rouge. The streams in this area are of rather low flow contributing less than 0.1 percent of the flow of the Mississippi River. The Bonnet Carre Spillway is one of only two sources of Mississippi River water entering the district. The other is accomplished by artificial pumping of Mississippi River water into Bayou Lafourche at Donaldsonville for water supplies along the Bayou (see Table 6.7 for water usage in this basin).

Groundwater

Water bearing soils are located at various depths as deep as 2,000 feet below mean sea level. Most aquifers are connected hydraulically and movement of ground water occurs rapidly within and to some extent among aquifers. This movement is primarily horizontal and down dip due to the impermeable nature of the intervening clay layers. Flushing of saline groundwater up to forty miles down dip of the normal inland intrusion is one example of this movement.

Except for local recharge areas fed by the rising and falling of the Mississipi River stages, all recharge and good groundwater areas are located outside the South Central Planning and Development Commission District boundaries in this basin.

Basin Description Source: Stanley Consultants, Inc. (1979).

TABLE 6.7

PUMPAGE OF WATER IN SOUTH CENTRAL LOUISIANA BY PARISH, SOURCE, AND PRINCIPAL USE, 1975
(IN MILLIONS OF GALLONS PER DAY)

PARISH	PUBLIC SUPPLY		INDUSTRIAL		THERMOELECTRIC		RURAL			IRRIGATION				TOTAL USE		
							DOMESTIC	LIVESTOCK		RICE		OTHER				
	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	GROUND	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	GROUND	SURFACE	TOTAL
ASSUMPTION	0	1.55	8.26	10.1	0	0	.02	0	.01	0	0	0	1.34	8.28	13.00	21.28
LAFOURCHE	0	7.63	0	29.0	0	0	0	.04	.18	0	0	0	.03	.04	36.84	36.88
ST. CHARLES	0	5.00	11.0	604.	0	1,540	.06	.04	.04	0	0	0	.30	11.10	2,149.34	2,160.44
ST. JAMES	0	1.66	5.15	275.	0	0	.04	.02	0	0	0	.11	7.91	5.32	284.57	289.89
ST. JOHN THE BAPTIST	1.03	1.37	3.88	87.7	0	0	.05	.01	.01	0	0	0	.35	4.97	89.43	94.40
TERREBONNE	0	17.0	.54	3.36	0	0	0	0	.05	0	0	0	.09	.54	20.50	21.04

SOURCE: Louisiana Department of Transportation and Development (1979): 14-15

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CHAPTER 7 - THE WETLANDS ECOSYSTEM

By

Edwin J. Durabb

INTRODUCTION

The South Central Planning and Development District land area sits astride one of the most dynamic and productive ecosystems in the world. In its entirety, coastal Louisiana contains about 10½ million acres of land: 1½ million acres are dry land, and 8½ million are coastal wetlands. These 8½ million acres represent roughly 25 percent of the entire wetlands average in the United States (Louisiana State Planning Office, 1977). South Central Planning and Development Commission contains nearly 31 percent (or 3½ million acres) of the State Total Wetland Area (Louisiana State Planning Office, 1975).

In previous chapters the geology, climate geomorphology, vegetation, water drainage and soils of the South Central Region have been discussed. These elements make up the parameters that enable the estuarine ecosystems of wetlands to function as a productive system to man and nature. The following is a discussion of the workings of this system and its value to man and to nature.

The wetlands estuarine ecosystems of coastal Louisiana are excellent examples of a productive, circular biologic system. The primary elements in this system are:

1. Sediment
2. Wetlands
3. Detritus
4. Water
5. Living Organisms
6. Other Properties of Ecosystem.

Each of these elements operate singly and in concert with the others to produce the massive biologic productivity of the coastal areas of our state. The following is a discussion of each element of this system.

SEDIMENT

Sediment performs several functions in the wetlands ecosystem:

1. Provides the base material upon which the ecosystem exists.
2. Shapes the surrounding landforms to delineate the estuarine basins.
3. Provide nutrients necessary for plant growth.

Before the advent of man, yearly overflow of the Mississippi River on its deltaic plain provided the sediment load responsible for deltaic plain progradation. Deposition within estuarine basins was limited to fine clays, heavier silty materials being deposited on the "natural levees". Since the advent of man and artificial flood control structures almost all sediment deposits have ceased within the South Central District (see Part I, Chapter 2 for a discussion of natural levees and deposition).

WETLANDS

The wetlands areas, consisting of swamp forest, fresh, brackish, and saline marsh, provide the floral vegetation component of the ecosystem. This vegetation provides habitat and food for primary consumers and provides "detritus" to the estuarine system (see Chapter 5 for a discussion of vegetation).

DETRITUS

"Detritus" or partially decomposed organic matter can be compared to the fuel that powers the living estuarine ecosystems in each basin. This material, derived from plants and animal waste, forms the food source for the organisms that make up the base of the wetlands food chain.

WATER

Water is the integrating factor in the estuarine ecosystem of the South Central District. Water performs the following functions:

1. Transports sediment from the River into wetlands areas providing nutrients to the basin.
2. Transports detritus throughout the system, providing the basic food source for the food chain base.
3. Determines the vegetation type at any point in the basin by its depth and salinity.
4. Provides the living environment directly or indirectly for all of the creatures of the ecosystem.
5. Provides the means of travel for the interaction of the living creatures of the system.

LIVING ORGANISMS

These are the creatures that use the natural resources of the system in their life cycles and generate the plethora of life both qualitatively and quantitatively, that exists in the ecosystems.

OTHER PROPERTIES OF ESTUARIES

Table 7.1 lists other properties of estuaries that interact to form the ecosystems extant in the South Central Region. These elements involve water, landforms, vegetation and detritus. These driving forces keep the system operating at a peak level of productivity.

TABLE 7.1

Physical Properties Governing

Productivity of Estuarine Systems

1. Confinement

   a. provides shelter that protects estuary from wave action
   b. allows plants to root
   c. permits retention of suspended life and nutrients

2. Depth

   a. allows light to penetrate to plants on the bottom
   b. fosters growth of marsh plants and tideflat biota
   c. discourages oceanic predators which avoid shallow water

3. Salinity

   a. freshwater flow may create a distinct surface layer over saltier, heavier bottom layer, indicating beneficial stratified flow
   b. fresh water dilution deters oceanic predators and encourages estuarine forms

4. Circulation

   a. sets up beenficial system of transport for suspended life when stratified such that the bottom layer flows in and the surface layer flows out
   b. enhances flushing
   c. retains organisms in favorable habitats through behavioral adaptations

5. Tide Driving Force

   a. transports nutrients and suspended life
   b. dilutes and flushes wastes
   c. acts as an important regulator of feeding, breeding, etc.

6. Nutrient Storage

   a. trapping mechanisms store nutrients within the estuary
   b. marsh and grass beds store nutrients for slow release as detritus
   c. richness induces high accumulation of available nutrients in animal tissue

Source: Clark, 1974: 2.

A VIEW OF THE ECOSYSTEM OF THE ESTUARINE BASIN

In this section we will travel down the estuarine system from the upper portion of the basin to the sea to provide the reader with an insight into the complex system at work in the wetlands areas that comprise the coastal areas. This section draws heavily from the work of Clark (1974), Mumphrey et al (1975), Day et al (1972), and Bahr and Hebrard (1976) for information on the ecosystem function. Let us begin our journey.

Upper Basin

Freshwater enters the system through river overflow and rainfall. This water is fresh and laden with sediment and nutrients as it flows off of the natural levee into the swamp forest. Trees living here use sunlight and these nutrients to grow. The shed organic matter into the shallow water is used by the organisms there as well as reused by the aquatic and terrestrial plants growing in the area. Three primary organisms operate here and throughout the rest of the system to form the base of the food chain. Although the location within the estuary will determine the species of animals present, their function in the system is the same (Day et al, 1973, and Mumphrey et al, 1975) have determined their function thusly:

> Packagers organize organic material into forms available for convenient transfer to higher tropic levels (life requiring higher forms of nutrition).
>
> These packagers may be autotrophs (they make their own food) or heterotrophs (they consume primary plant matter). Cord grass (Spartina) and phytoplankton are examples of the former; snails and zooplankton are examples of the latter.

Regulators are organisms with generalized feeding habits. They regulate populations by feeding on the most abundant food sources. Regulators have longer life spans and larger individual sizes than packagers. They are also highly mobile. Regulators are sub divided into two classes: subsystem regu lators and whole system regulators. Subsystem regulators feed on specific organisms, thus controlling specific populations. Catfish, blue crabs, shore birds, drum, croaker, etc. are considered subsystem regulators. This level (subsystem regulators) is analogous to mid-level carnivores. Whole system regulators feed on system regulators, as well as what the subsystem regulators feed on. Thus, they regulate the other regulators. This group includes animals such as trout, coons, most birds, and man. There is little predation on these organisms (also called top carnivores), except by man who, of course, has assumed the role of regulator of the entire system.

The Regenerators take waste from all sources and regenerate these wastes into nutrients to start the whole cycle over again. Bacteria, yeasts, etc., are examples of this type of organism.

Table 7.2 illustrates some examples of each type of organism. It is by no means implied that these categories of life are rigid. There are organisms that function in more than one capacity. What these categories attempt to do, is point out the organism's primary function in the estuary. This enables the larger scheme of life to be assembled more simply to give the reader a more general, but fairly accurate view of the circle of life.

Source: Mumphrey et al (1975), pages 45, 47.

TABLE 7.2

Ecological Roles of Some Estuarine Species

Packagers	Regulators	Regenerators
Spartina	Mature Fish	Bacteria
Benthic Algae	Proposus	Yeasts
Periphyton	Pelicans	Molds
Phytoplankton	Herons	Meiofouna
Killifish	Egrets	Protozoa
Shrimp	Gulls	
Fiddler Crabs	Comb-jellies	
Juvenile Fish	Raccoon	
Marsh Snails	Man	
Modiolus		
Oysters		

Source: Day et al, 1973.

The Swamp Forest provides habitat for birds, fish, reptiles, insects, etc. Water flowing by means of pressure and a very slight downhill grade moves detritus and organisms out of the swamp forest into the fresh marsh.

Fresh Marsh

Fresh water continues its flow to the sea through the fresh marsh zone. Two kinds of flow occur throughout the ecosystem sheetflow and channel flow. Sheetflow is the general movement of surface water through the wetlands towards the Gulf. This is important because this slow flow allows nutrient exchange between the marsh and water. Detritus is used and new detritus is produced and moved downstream. Channel flow is also slow but here the water is slightly deeper and moves a bit faster. Adequate nutrient exchange occurs here also.

The only effect the Gulf of Mexico has on freshwater areas is a very slight tidal influence. Habitat is diverse here. A few more species of marine fish have been sighted near the lower end of the freshwater area, but, for the most part, this zone is noted for the detritus and fresh water it supplies to the lower part of the basin, as well as for habitat.

Brackish Marsh

This zone may be the most important part of the estuary system. It is here that inland fresh water and fresh water species meet marine waters and their associated organisms.

In this zone, tidal influence is more pronounced and the water tends toward increasing salinity. Many species of sea animals use this zone for nursery areas. Among them are menhaden, shrimp, crabs, and others.

Perret (1971) has estimated that the estuary is relied on directly, (nursery and habital) or indirectly (food sources), by seventy-five percent of all fish and ninety percent of the eight most abundant fish and invertebrates that inhabit Louisiana's coastal waters. It is in the brackish water zone that juvenile sea creatures feed and are protected until they can fend for themselves in open water.

The prime reason for this brackish water zone is the shallow sinuous channel flow to and from the Gulf, as well as sheetflow. In these shallow, slow moving systems, water tends to mix rather than maintain its saline or fresh integrity, thus modifying extremes to a great extent (Clark, 1974). This single fact has enabled this zone to serve as the nursery area of the estuarine system. It is also here that man-made influences have upset the balance of the ecosystem the most (see Part III, Chapter 4 for further discussion).

Salt Marsh

This zone is highly marine in character. Detritus and fresher waters intrude occasionally, but saltwater is the norm for this area. Although not as productive as the brackish zone, this area serves similar function. Daily tidal flushing is high here, and this area is subject to rapid erosion during storm periods.

As this area erodes, each zone is pushed further inland. This is a natural process that eventually results in the sea reclaiming the entire deltaic plain. Here, as elsewhere, man-made influences have altered the ecosystem significantly and increased the rate of erosion.

Resultant Estuarine Productivity

The result of this estuarine interaction within these coastal basins (Pontchartrain, lower Mississippi, Terrebonne, and Barataria) is tremendous productivity. It is no accident that the state with the most wetland area also leads the nation in fisheries production. Tables 7.3 and 7.4 illustrate is productivity in the area of commercial fisheries. These figures do not include the sport fishing catch in Louisiana waters. The millions of birds, especially ducks that frequent the marsh and the fur bearing creatures that are harvested yearly, also enhance the value of this ecosystem to man. Table 7.5 lists some of the benefits that the coastal wetlands provide to man and to nature. Later in this report, we will investigate what man has done to this ecosystem and the effects of these activities on the evolution of the wetlands.

TABLE 7.3

U. S. COMMERCIAL LANDINGS*

U. S. Commercial Landings, By States, 1975 and 1976 (1)(2)

(Six Leading States)

STATE	1975		1976		Record Landings	
	Thousand Pounds	Thousand Dollars	Thousand Pounds	Thousand Dollars	Year	Thousand Pounds
Louisiana	1,124,586	88,245	1,227,958	136,971	1971	1,401,252
California	850,000	129,366	896,858	185,647	1936	1,760,183
Virginia	444,110	32,463	528,430	43,091	1972	666,180
Alaska	437,908	143,836	616,351	227,208	1936	932,341
Mississippi	308,502	15,520	291,904	22,006	1971	400,576
Massachusetts	269,952	78,470	288,518	97,605	1948	649,696

(1) Statistics on landings are shown in round (live) weight for all items except univalve and bivalve mollusks such as clams, oysters, and scallops which are shown in weight of meats excluding the shell.

(2) Landings in interior waters estimated.

* Ranked by weight of catch.

Source: U. S. Department of Commerce (1977) page 4.

TABLE 7.4

U. S. COMMERCIAL LANDINGS

Quantity of Commercial Fishery Landings

at Certain U. S. Ports, 1976

Port	Thousand Pounds
San Pedro, California	600,900
Cameron, Louisiana	385,300
*Dulac-Chauvin Louisiana	236,900
Pascagoula-Moss Point, Mississippi	218,600
Empire, Louisiana	214,000
Morgan City, Louisiana	163,800
Kodiak, Alaska	151,400
Gloucester, Massachusetts	144,200
San Diego, California	100,700
Dutch Harbor, Alaska	91,300

* Located in SCP&DC District

Source: U. S. Department of Commerce (1977), page 5.

TABLE 7.5

Benefits of the Estuarine Ecosystem

A. <u>Benefits to the Natural System</u>

1. Habitat for birds, fish, mammals, reptiles and the varied flora of the region.

2. Nursery area for birds, fish, mammals, and reptiles.

3. Food Source for the creatures of the open Gulf of Mexico.

4. Nutrient source for luxurious plant growth of the basins.

B. <u>Benefits to Man</u>

1. High assimilative capacity to absorb pollutants.

2. High yield of birds, fish, mammals, reptiles to both commercial and sport interests.

3. Buffer zone against tropical storms.

4. Recreation area for coastal residents.

Source: Author

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PART II

LAND USE

CHAPTER I - POPULATION AND SETTLEMENT PATTERNS

By

Dr. Paul Leslie

GENERAL HISTORY

At the end of the seventeenth century when initial European contacts with Louisiana occurred, about 15,000 Indians lived in the state (Davis, 1965). There were numerous tribal groupings, but in the Lower Mississippi Delta were about twelve different tribes, only five of which lived permanently in the South Central Planning District. They included the Chitmacha, on the upper portions of Bayou Lafourche; Washa/Chawasha, in the middle portions of Bayou Lafourche; Quinipissa, near present-day Hahnville; Bayougoula, on the Mississippi River south of Baton Rouge; and Tangipahoa, along the north and south shores of Lake Pontchartrain (Knipmeyer, 1956).

The tribes of the area belonged to the Eastern Maize Culture group, hunters and fishermen who depended on agriculture for their foodstuffs. For most Indians agriculture dominated their daily routines. The tribes first cleared their fields by tree deadening or burning. Then, to break the land, they used makeshift implements. Every so often these plots lost their productivity and forced the tribes to shift their crop production to adjacent lands. All of these tribes lived in rectangular structures with wattledaubed walls and palmetto roofs, or houses made entirely of palmetto; these structures were arranged adjacent to a central area that the tribe used in common (Davis, 1965).

The French were the first to make colonization efforts in Louisiana. In 1718 they successfully founded a colony at what would later become New Orleans, an important support facility for further colonization along the Mississippi and inland waterways. Prior to 1718, the French government had unsuccessfully tried to settle the Mississippi. Its frustrations ran so deep that for many years government officials limited their activities to the area along the Gulf coastal region (Taylor, 1976).

Under the French, the colony did not experience rapid growth. In 1721 there were 370 residents in New Orleans, and by 1770 only 3,190 (Davis, 1965). Colonists did not realize their initial expectations; trade with the Indians and Canada never reached anticipated levels. The settlers were disinterested in farming and frequently complained about the "sterility" of the soil. They had come for quick riches, but colonizers found swampy lowlands, disease, tropical storms, occasional Indian hostilities - and no precious stones (Taylor, 1976).

For the most part, the French settlers stayed near New Orleans. The first large-scale settlement movement beyond the boundaries of the Crescent City came during the 1720s when John Law took charge of French colonization efforts; for the government now gave more attention to increasing the numbers of settlements in Louisiana. Government agents combed the European countryside trying to infect all who would listen with colonization fever. Their efforts attracted large numbers of Germans, who eventually came to Louisiana to establish farms and raise families but not to make quick riches. Their decision to come to Louisiana, according to one observer, "probably saved the colony," (Davis, 1965).

The Germans proved to be excellent pioneers. But even before coming to the new world they faced tremendous hardships. Officials forced thousands to wait in French ports before they could book passage. When almost 6,000 left, they were forced to wait again in Gulf coastal ports while administrators pondered their fate once again. Detention took its toll, because one estimate is that only 2,000 out of the 6,000 ever reached Louisiana. Still, once the Germans gained access to their lands, they went to work and helped the colony lessen its dependence on outside foodstuffs.

Interestingly, the German settlements were never large. For example, the town of Hahnville, which had begun to show the early signs of settlement activity, had 167 residents in 1724, but only 174 in 1731. The reason is that the French began discouraging German migration. Meanwhile Germans already in the colony were quickly gallicized by their neighbors. The cultural uniqueness of the Germans disappeared and so did their Teutonic names; Trisch became Triche and Foltz became Folse (Taylor, 1976).

Few Germans went into the marsh to trap and fish; instead, they cultivated the lands above New Orleans where their settlements acquired their own distinctiveness. This area became known as La Cote des Allemands. Later these settlements were divided into Primera Costa (St. Charles Parish) and Segunda Costa (St. John the Baptist Parish). And west of New Orleans, such place names as Lake Des Allemands and Bayou Des Allemands still provide evidence of these earlier settlers (Knipmeyer, 1956).

The French were never successful in sustaining the growth of the colony. Only after 1762 when Spain took control of the colony from France as a settlement for the French and Indian War did Louisiana's population begin to grow. In New Orleans, for instance, the population increased from 3,190 in 1770 to 10,000 by 1803. The Spanish were very interested in putting as many new colonists as they could between their colony and the Anglo-Americans, and one of their chief inducements was free land. Spanish authorities promised each settler five arpents of land (192 feet per arpent) fronting a waterway and approximately forty arpents deep Each family also received a spade, two hens, a cock, and a two-month old pig to establish a household. The only government imposed conditions were that the immigrants swear allegiance to Spain and openly practice the Catholic religion (Davis, 1965).

The primary beneficiaries of the Spanish policy were the Acadians, who arrived in Louisiana during the 1760s after having been driven out of Nova Scotia (Acadia) by the British during King George's War. Thousands fled to Canada and to the Atlantic seaboard. The largest group (4,000 to 10,000) came to Louisiana where they were accepted by the people who were culturally related. The Acadians first settled near modern-day St. Martinville, but later groups went up the Mississippi and down Bayou Lafourche to establish the Acadian coasts. For the most part, these simple people, sometimes called petits habitants, were excellent small farmers. They tended to isolate themselves from the rest of the colony and asked others to respect their separate society. Over the years, the Acadians multiplied so much so that in 1772, Spain created the ecclesiastical Parish of Ascension. Six years later, in 1778, the district of Valenzuela was established in what today is called Assumption Parish.

The Acadians followed a fairly routine existence on Bayou Lafourche. Once on their lands, they unpacked their cultural baggage and tried to reconstruct the familiar sights, smells and sounds they had known in Canada. They built simple cabins and cleared and tilled the soil with the help of their families. Generally, there were no large landholders, each family having only what it needed to survive. They relied on such standby crops as corn and rice and learned to grow new ones, such as cotton and possibly okra, and African vegetable. Cattle and other domestic animals were left to roam unattended at the swamp's edge. And for those needs beyond the farm, these petits habitants cut and marketed swamp cypress and Spanish moss (Voorhies, 1978). Some Acadians turned away from subsistence agriculture and engaged instead in hunting, trapping, fishing or lumbering. But, for the most part, they were small farmers who raised what they needed to maintain their families.

The influx of so many French Acadians caused concern among Spanish officials that their control of the new colony would be undermined. To offset this they recruited Spaniards from the Canary Islands and the Iberian Peninsula. Called Islenos, they established themselves on the eastern bank of the Mississippi, below New Orleans, and at Valenzuela in Assumption Parish. Ethnographically, however, the Islenos fared no better than the Germans; only a few place names and family surnames (Martinez) have survived (Knipmeyer, 1956).

One group that Spain did not have to spend time or money recruiting to its colony was the Anglo-American who began to arrive in large numbers after the Revolution. They came by land and sea from all the states seeking the free land that Spain offered to new settlers. These newcomers scattered all over the state, establishing commercial shops in cities and establishing plantations along the waterways.

The arrival of the Anglo-Americans was felt especially along Bayou Lafourche as the Acadians attempted to recreate their former Canadian lifestyle. But with the crystallization of sugar by Etienne de Bore in 1974, cotton planters and small farmers from the lower South beseiged South Louisiana, hoping to get ahead. As the accompanying population tables indicate, the boom and bust cycles of cotton caused many newcomers to turn to sugar as an alternative. With its fertile natural levees and a waterway linking the Mississippi River with the Gulf of Mexico, Bayou Lafourche and its adjacent waterways became the center of resettlement activities. In 1827, no less than $50,000 worth of its woodlands were purchased by planters from the Natchez, Mississippi area (Sitterson, 1953). Each week, one New Orleans newspaper noted, saw the arrival on the Bayou of prospective purchasers "to examine the country with the view of purchasing and settling therein," (Sitterson, 1953). For the Acadians the offers were indeed tempting. Many sold their lands. Thus an area once densely settled by French-speaking white yeoman farmers was soon transformed into plantations occupied by a few wealthy Americans with many black slaves (Comeaux, 1978).

From the beginning, African slaves had been imported into the colony. Their numbers, however, were never large. They constituted less than twenty percent of the colony's population and the rapid increase in their numbers came only after the invention of the cotton gin and the crystallization of sugar. Along Louisiana's waterways plantations developed, their work force being black bondsmen. The plantation economy depended on African laborers so much that just before the Civil War blacks in agricultural parishes represented more than fifty percent of the total population. After the war, the black population began to decline because of economic distress, labor-saving technology and such disasters as floods.

By the time of the Louisiana Purchase in 1803, the intermittent waves of immigrants had produced a continuous line of settlement below Donaldsonville. These included the German Coast (St. Charles and a portion of St. John the Baptist Parishes) and the First and Second Acadian Coasts (St. John the Baptist and St. James Parishes). In addition, the petits habitants had established Acadian settlements along Bayou Lafourche between Donaldsonville and Thibodaux.

SETTLEMENT PATTERNS

Down through the twentieth century, the settlement patterns of the South Central Planning District were dictated by its waterways, the area's primary transportation arteries. Both the French and Spanish had found waterways a convenient reference point for dividing the land; both governments employed the arpent (192 feet square) as their measuring unit. Land grants were usually five by forty arpents. This system insured that the grantees would receive the different qualities of land evenly. This practice produced long continuous lines of closely spaced buildings on the levees.

These structures fronting the waterways constitute what William Knipmeyer called the linear settlement mode, a pattern characterized by long lines of buildings interrupted at irregular intervals by varying lengths of empty spaces (Knipmeyer, 1956). Today the linear settlements are held together by roads on either side of the waterway, the automobile having replaced the boat. Within the South Central Planning District, the settlement along Bayou Lafourche represents possibly the clearest example of the linear pattern. For almost one hundred miles below Donaldsonville, there is an almost uninterrupted succession of buildings. Examples of this mode are the settlements of Bayou Point aux Chenes and Bayou Dularge.

Within the linear settlement, however, are internal distinctions that further set-off the populations from each other and adjacent lands. The most striking involve urban and agricultural areas.

Whether on the Mississippi or Bayou, urban settlements are population centers developed at the convergencies of waterways, crossings or where early settlers saw fit to erect their church. The location of churches was especially important. Because after them came the construction of commercial buildings and then schools. Some idea of the importance of this factor can be gained along the Mississippi where churches and urban communities appear every twenty or so miles and along Bayou Lafourche where ten miles is the approximate distance of separation (Knipmeyer, 1956).

The simple nucleus of a church, school, and commercial activities became the springboard for more complex urban growth. According to Knipmeyer, these linear settlements began to expand into more advanced forms, such as the "T" towns and the grid cities. The "T" town has a population of 1,000 to 2,500 and includes at least one street perpendicular to a waterway. Also there is an increase in the number of commercial establishments and services offered by professional (as in Labadieville and Luling). As the "T" town grew, streets parallel to the waterway were built and generally became the first indication of its transformation into a grid city. In the grid city the population is more than 3,000 and the services provided residents are more varied and numerous. Moreover, in grid cities, such factors as the confluence of roads or waterways are more significant in triggering growth (as in Houma, Napoleonville, and Thibodaux), (Knipmeyer, 1956).

Finally, there is the dispersed settlement which is neither urban nor agricultural. It includes the swamp and marsh populations. The swamp population is on the periphery of large swamps, similar to the area between the Mississippi River and Bayou Lafourche, or around Lake Maurepas and Lake Pontchartrain. The houses of these settlements are in an unorganized pattern, generally along the roads or bayous leading into the swamp. The marsh settlement is distinguished by its dependence on trapping. The residents live on lake shores or banks of bayous and canals. Their numbers are never large since the occupations of the marsh people are seasonal. At present the marsh settlement is in decline as more and more residents seek employment security. These settlements are characterized by large numbers of single family members and limited inter-relationships with other settlements (as in Bayou Gauche and Isle a Jean Charles near Point aux Chenes), (Knipmeyer, 1956).

Tables 1.1, 1.2, and 1.3 illustrate the population growth patterns in the South Central District from 1810 to 1970.

TABLE 1.1

TOTAL POPULATION

PARISH	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910*	1920	1930	1940	1950	1960	1970
Assumption	2,472	3,678	5,669	7,141	10,538	15,379	13,234	17,005	19,616	21,620	24,128	17,912	15,990	18,541	17,278	17,991	19,654
Lafourche	1,085	3,750	5,425	4,425	9,532	14,044	14,719	19,088	22,089	28,882	33,111	30,344	32,419	38,615	42,209	55,381	68,941
St. Charles	3,291	3,863	5,147	4,700	5,120	5,297	4,867	7,147	7,737	9,072	11,207	8,586	12,111	12,321	13,363	21,219	29,550
St. James	3,957	5,660	7,646	8,548	11,098	11,499	10,152	14,712	15,668	20,197	23,009	21,228	15,338	16,596	15,334	18,369	19,733
St. John the Baptist	2,990	3,854	5,677	5,776	7,317	7,930	6,762	9,647	11,317	12,330	14,338	11,896	14,078	14,766	14,861	18,439	23,813
Terrebonne			2,121	4,410	7,724	11,988	12,451	17,724	20,111	24,464	28,320	26,974	29,816	35,880	43,328	60,771	76,049
Louisiana Totals	76,556	153,407	215,739	352,411	517,762	708,002	726,915	939,946	1,118,588	1,381,625	1,656,388	1,798,509	2,101,593	2,363,880	NA	NA	3,641,306
District Totals	(12,690)	(18,803)	(31,685)	(35,000)	(51,329)	(66,137)	(62,185)	(85,323)	(96,538)	(116,565)	(134,113)	(116,940)	(119,762)	(138,719)	(146,373)	(192,170)	(237,740)

Source: U. S. Census Reports, 1810-1970.

TABLE I.2

WHITE POPULATION

PARISH	1810	1820	1830	1840	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970
ASSUMPTION	1,915	2,409	3,760	4,103	5,170	7,189	6,247	8,933	10,726	12,181	14,021	10,425	9,671	11,010	N/A	N/A	N/A
LAFOURCHE	1,681	2,712	5,025	3,998	5,142	7,500	8,060	11,232	14,270	20,626	25,136	24,456	27,037	32,659	36,531	N/A	N/A
ST. CHARLES	820	728	676	874	867	938	897	1,401	1,986	2,970	4,487	4,239	7,902	8,412	9,002	N/A	N/A
ST. JAMES	1,964	2,522	2,557	2,762	3,285	3,348	3,275	4,850	5,691	8,839	9,844	9,624	7,742	8,368	7,626	N/A	N/A
ST. JOHN THE BAPTIST	1,402	1,402	1,980	2,141	2,586	3,037	2,715	3,853	4,680	5,145	6,208	5,478	7,131	7,890	7,445	N/A	N/A
TERREBONNE	N/A	N/A	1,063	3,946	3,305	5,131	6,080	8,613	10,412	14,142	16,981	17,586	20,431	25,997	32,658	N/A	N/A
LOUISIANA TOTALS	34,311	73,383	89,441	158,457	255,491	351,556	N/A	N/A	558,395	729,612	941,086	1,095,611	1,318,160	1,511,739	N/A	N/A	N/A

Source: U. S. Census Reports, 1810-1970.

TABLE I.3

BLACK POPULATION

PARISH	1810*	1820*	1830*	1840*	1850*	1860*	1970*	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970
Assumption	557	1,161	1,909	3,038	5,368	8,100	6,984	8,067	8,890	9,438	10,105	7,487	6,319	7,530	N/A	N/A	N/A
Lafourche	304	1,038	400(?)	427	4,390	6,544	6,659	7,806	7,819	8,184	7,973	5,888	5,313	4,635	5,678	N/A	N/A
St. Charles	2,471	3,315	4,470	3,826	4,253	4,359	3,036	5,746	5,751	6,100	6,720	4,347	4,199	3,909	4,361	N/A	N/A
St. James	1,993	3,138	5,089	5,786	7,813	8,151	6,877	9,862	9,097	11,366	13,161	11,602	7,550	8,228	7,708	N/A	N/A
St. John the Baptist	1,588	2,452	3,697	3,635	4,731	4,893	4,044	5,702	6,637	7,184	8,126	6,415	6,947	6,876	7,416	N/A	N/A
Terrebonne	N/A	N/A	1,058	464	4,419	6,857	6,172	9,111	9,699	10,312	11,104	8,742	8,349	8,823	10,670	N/A	N/A
Louisiana Totals	N/A	N/A	N/A	N/A	N/A	(345,273)	N/A	N/A	(559,193)	(650,804)	(713,874)	(700,257)	(776,326)	(849,303)	N/A	N/A	N/A

* Includes slave population and free Negroes.

Source: U. S. Census Reports, 1810-1970.

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CHAPTER 2 - AGRICULTURE

By

Dr. Paul Leslie

And

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HISTORY

The agricultural settlements of the South Central District have been a part of the landscape for more than two hundred years. Originally, the single family establishment dominated the area's physical environment. But as the number of inhabitants increased and commercialism became a part of agriculture, the large sugar plantations dominated the landscape. Although the family-based agricultural units are easily recognized, the plantation environment exhibits a trait of agglomeration, so that small villages are apparent.

The most common plantation pattern that developed along the Mississippi was the linear settlement. Owners constructed a centralized road through the heart of their land and flanked it with dwellings for laborers. The sugar mill and its outbuildings were located at the end of the road and close to the back swamp. In this case, the owners sought to minimize the distance cord wood would have to be hauled. The second pattern of plantation development was that of the block shaped, used most often along Bayou Lafourche. Clusters of what John Rehder called nodal blocks were placed near the center of the land holdings. Connected to the Bayou by a central road, the block surrounded the sugar house with a grid-patterned workers' settlement. The reason for this arrangement is that the front part of the natural levees were originally settled by the Acadians, and the Anglo-Americans, upon reaching Bayou Lafourche, found themselves limited to the backlands. At a later date, many American settlers purchased parcels of frontage from the petits habitants (Rehder, 1978).

The remaining agricultural settlement form developed in Terrebonne Parish. Unlike the buildings in the Mississippi and Bayou Lafourche developments, plantation buildings were located closer to the waterways of Terrebonne and on the crests of the natural levees of both banks. With its western neighbors, Terrebonne Parish was the last of the state's lands opened for settlement and consequentially the lands purchased by Anglo-Americans included wide waterway frontage (Rehder, 1978).

SUGARCANE

After much trial and error the crop of sugarcane was selected as the agricultural commodity best suited to the soil and climate of the natural levee soils in the South Central District. This fact has held true into the twentieth century. In recent years, however, with the fluctuating nature of the sugarcane market, the industry has fallen upon hard times. Figure 2.1 illustrates the current status of the industry as of 1979. As can be seen, there has been some economic decline reflected in processing mill closings in the last few years. This crop still, by far, however, occupied the most available land and employs the most people of any agricultural endeavor in the South Central District.

Fact Sheet for Sugarcane Industry
within Boundaries of South
Central Planning & Development Commission

I Mills

A) Number of Mills in area 10

B) Number of Mills in state 28

35.7% of the mills in the state are in this area.

C) Three (3) Mills closed in the last three (3) years

D) 100 workers (average) are employed by the mills during grinding. With 100 workers (average) per mill and 10 mills in the district approximately 1000 workers are employed during grinding.

E) Immediate Needs of Mills

1) Pollution devices (both water and air)

2) Changing boilers from natural gas as a fuel to baggass.

II Farming of Cane

A) Cane Acreage for 1978 Production

PARISH		ACREAGE
Assumption		38,187
Lafourche		34,472
St. Charles		1,638
St. James		23,358
St. John		14,472
	Area Total	120,157
	State Total	296,000
	%	40.6%

B) Farms in the Area

PARISH		NUMBER OF FARMS
Assumption		110
Lafourche		126
St. Charles		3
St. James		75
St. John		26
Terrebonne		47
	Area Total	387
	State Total	1007
	%	38.4%

C) Average Acreage of Farms by Parish

PARISH	SIZE OF FARM
Assumption	347
Lafourche	274
St. Charles	546
St. James	371
St. John	309
Terrebonne	308

15,000 field workers in the state. This area having 40.6% of the state acreage has approximately 6,090 field workers.

2,500 direct service industry employees state wide for cane industry. This area is the home of CAMCO and Thomson Machinery which are two of the largest cane equipment producers.

Source: Interview with American Sugarcane League Official (1979).

OTHER CROPS

Because of a fluctuating sugar market, other crops have been recently introduced into the South Central Region, notably soybeans. Table 2.1 lists the major crops in the South Central District as of 1978. As can be seen from this table, sugarcane is still the predominant crop. However, soybeans occupy considerable acreage. Present indications are that soybean acreage will continue to slowly increase at the expense of sugarcane in the near future.

TABLE 2.1

Major Crops in the South Central Region

1978

(in acres)

PARISH	SUGARCANE[1]	SOYBEANS	CORN[2]	TRUCK CROPS[3]
Assumption	34,900	1,500	100	250
Lafourche	32,000	2,300	450	450
St. Charles	1,050	0	50	200
St. John	21,700	6,400	250	150
St. James	7,250	2,300	100	150
Terrebonne	13,330	6,000	200	150
Total	110,230	18,500	1,150	1,350

1. Figures indicated are acres harvested for sugar. Multiply this figure by approximately 9% for total sugarcane acreage. estimate.

2. Corn used mainly for home consumption.

3. Fresh crops are usually consumed at home or used in roadside stands. Some exceptions to this include St. Charles Parish where crops are sold to New Orleans because of proximity to the market.

Source: Louisiana Crops and Livestock Reporting Service (1979) and Richard Folse, County Agent U.S.A.S.C.S.

FARMLAND LOSS

Perhaps the biggest future problem that will confront agricultural interests in the South Central District is agricultural land loss to urbanization and industry. Much land has and will continue to be gobbled up by industry and urban spread. This land is usually taken from agriculture due to the differences in value between land use for agriculture, urban or industrial activities. Table 2.2 illustrates the decrease in crop acreages over a twenty-five year period in our district. It appears that unless agricultural land is viewed as a resource instead of a commodity, this trend will continue in the immediate future (see Part II, Chapter 4 for a further discussion of conflicts in the uses of land in the South Central District).

TABLE 2.2

Total Cropland

(1950 - 1975)

(in acres minus pasture)

PARISH			
Assumption	56,000	56,000	-0-
Lafourche	81,320	72,000	- 9,320
St. Charles	19,000	15,000	- 4,000
St. John	29,000	19,000	-10,000
St. James	44,313	39,000	- 5,313
Terrebonne	41,727	38,366	- 3,361
Total	271,360	239,366	-31,994

Source: Louisiana Crops and Livestock Reporting Service (1975) and Richard Folse, County Agent U.S.A.S.C.S.

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CHAPTER 3 - INDUSTRIAL LAND USES

By

Edwin J. Durabb

INTRODUCTION

Industrial Land Use, like other land uses in the South Central District is concentrated along the natural levees where the good drainage, soils, and cheap water transportation are available. The following sections will discuss general features of this type of development. Following this, two examples will be selected to illustrate the types of industrial and commercial development prevalent in the South Central Region.

INDUSTRIAL LAND USE

There are basically five types of industrial development in the South Central Region.

1. Non oil and gas related industry dependent upon the Mississippi River.
2. Oil refineries and related petrochemical industries dependent on River Transportation.
3. Oil and gas production and support facilities.
4. Nodal development dependent on both transportation and production - support oil and gas facilities.
5. The fishing industry.

Table 3.1 lists current values of industrial development by parish in the South Central District. Figure 3.1 illustrates the distribution of this investment in the recent past, compared with the 1978 year.

TABLE 3.1

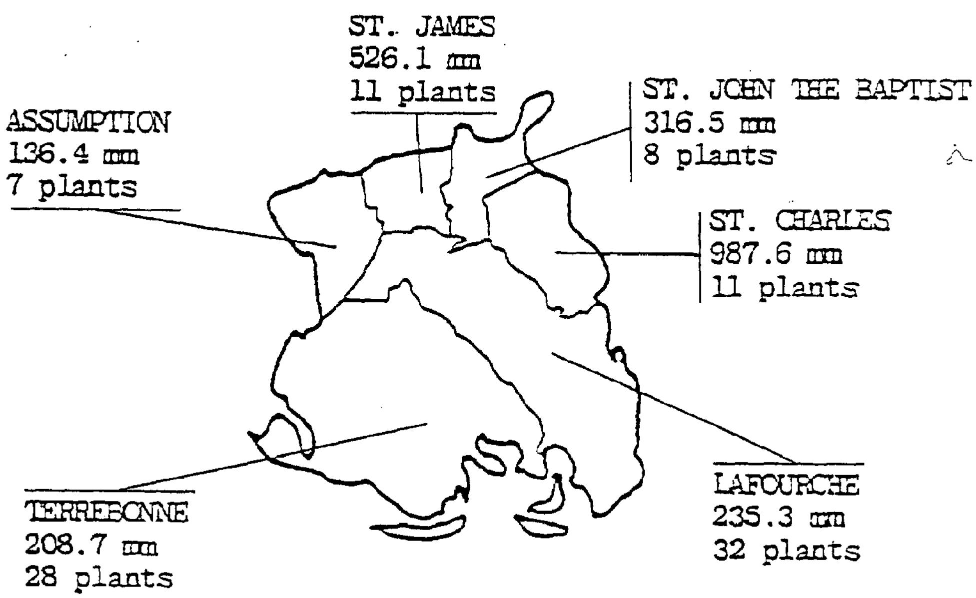
RECENT HISTORY OF INDUSTRIAL INVESTMENT BY PARISH
FOR EAST SOUTH CENTRAL LOUISIANA

PARISH	1972-77	1978
Assumption	9,614,001	$ 11,369,706
Lafourche	1,191,202	7,435,304
St. Charles	1,454,540,305	840,657,203
St. James	163,273,759	282,643,901
St. John the Baptist	363,271,928	46,611,211
Terrebonne	1,548,975	12,800,000
TOTAL	$1,993,440,170	$1,201,517,325

Source: Louisiana Dept. of Commerce (1976) page 1.

FIGURE 3.1

MANUFACTURING SHIPMENTS AND PLANTS IN EAST SOUTH CENTRAL LOUISIANA, 1977



Source: Louisiana Department of Commerce (1979) page 1.

THE MISSISSIPPI RIVER PARISHES

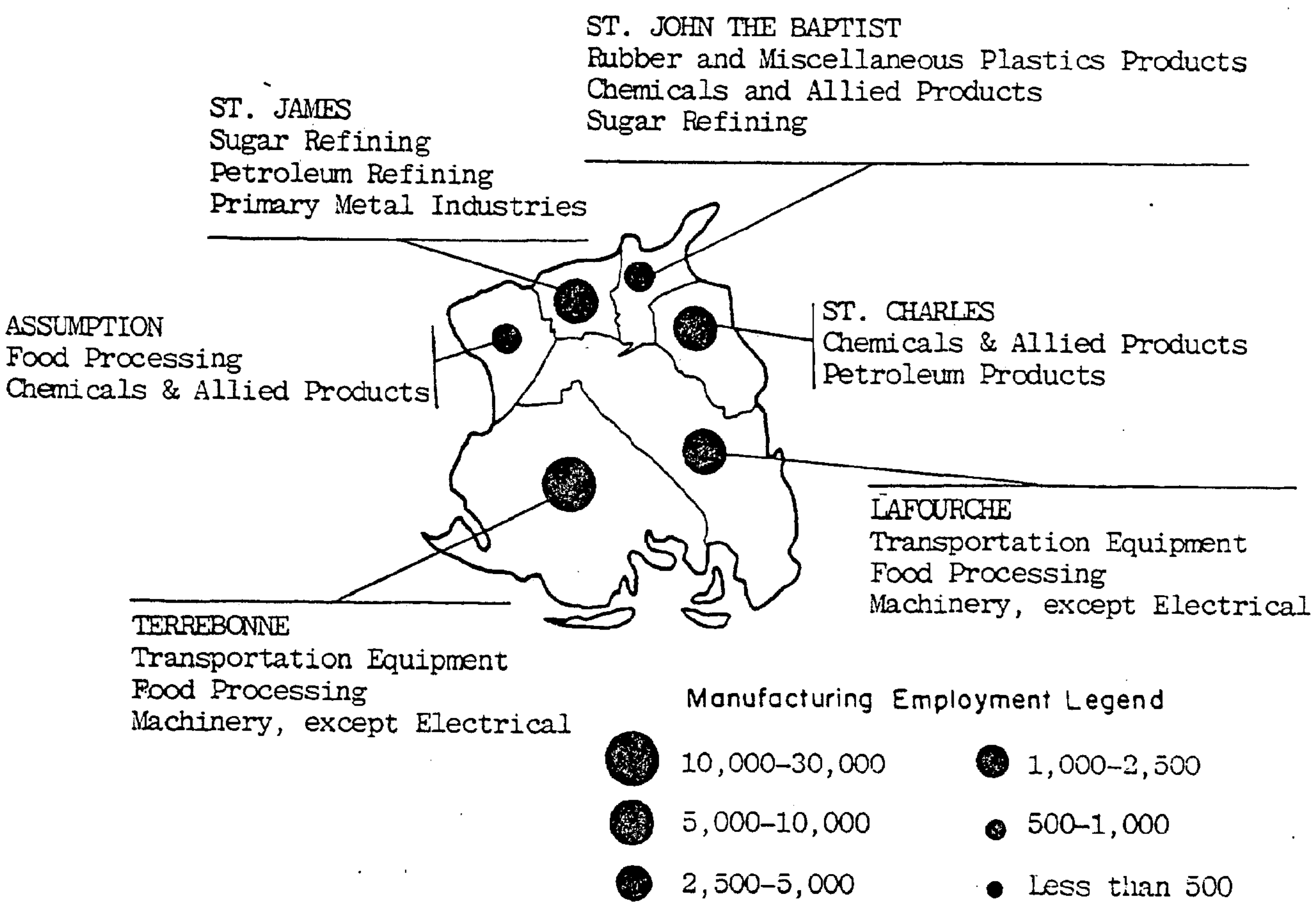
The South Central Planning and Development Commission parishes of St. James, St. John the Baptist and St. Charles offer excellent sites for the large industrial concerns that have and are continuing to locate there. The following factors have influenced the location and type industries that now cover large areas near the Mississippi River.

1. Availability of cheap transportation for raw materials (Mississippi River).
2. Availability of large tracts of land along the transportation artery (Mississippi River).
3. Cheap, voluminous source of fresh water for industrial processes.
4. Proximity to sources of raw materials (oil and gas).
5. Proximity to a large port (New Orleans).
6. Favorable local governmental attitude in the form of relatively few restrictions and favorable tax status.

The predominant industries along the River are oil refineries, related petro-chemical plants and bulk storage facilities for grain and raw materials. An example of this type of industrial development is illustrated in St. John the Baptist Parish. Although each of the three river parishes is somewhat different, this parish can serve as an example of the kinds of industrial facilities that exist along the river. (Figure 3.2 illustrates the types of industries prevalent in all three parishes.

FIGURE 3.2

MANUFACTURING LOCATIONS AND EMPLOYMENT LEVELS IN EAST SOUTH CENTRAL LOUISIANA



Source: Louisiana Department of Commerce (1979) page 1.

ST. JOHN THE BAPTIST PARISH

General

St. John Parish sits astride the Mississippi River in the north-eastern portion of the South Central District (see Figure 3.2). In 1980, the population of the parish was 23,813 with the 1980 estimate being 35,941. The parish is currently experiencing growth from existing and new industry, as well as suburban spillover from the New Orleans area, which is located 25 miles away. As in other parishes in the South Central Planning & Development Commission region, this area is predominantly wetland with the two portions of the Mississippi River natural levee, providing the only high developable ground in the area (SCP&DC, 1979). Of the total parish area, of 238,108 areas, only 36,556 areas are not wetland or about 15 percent of the total (Louisiana State Planning Office, 1975).

Governmental

The parish is currently governed under the Police Jury form of government. Due to the splitting of the Parish by the Mississippi River and the lack of a bridge to cross it, parish services must be duplicated on the east and west bank.

There are <u>no</u> incorporated municipalities in this parish. There are no zoning ordinances or housing codes. There are, however, subdivisions and floodplain regulations. Within a year, a comprehensive Coastal Zone Management Ordinance will be in place to manage and regulate wetlands areas of the parish.

Industries

Table 3.2 illustrates existing industries in the parish. The major employers are petro-chemical related or plants requiring cheap transportation of raw materials.

Table 3.3 illustrates the proposed new industries within the parish as of early 1979.

Table 3.4 lists the employment categories in the Labor force in St. John Parish as of 1978. As can be seen, the largest single employer is manufacturing.

With the Kaiser Aluminum plant, and the projected steel mill, there appears to be some trend away from petro-chemical industries, at least in St. John the Baptist Parish.

TABLE 3.2

Existing Industry

Following are the names of most of the manufacturing firms in St. John the Baptist Parish with the size of their work force and their end products.

Edgard		
Caire and Granyard	raw sugar	100
Garyville		
Marathon Oil Company	energy products	195
NALCO Chemicals	chemicals and chemical preparation	80
LaPlace		
Castro, Inc.	wood pallets and sheds	8
F & M Concrete Compan, Inc.	ready-mix concrete	10
Riverlands Publishing Company	printing	15
E. I. Dupont de Nemours	chemicals	525
Reserve		
Cargill, Inc.	grain elevators	60
The Ceco Company		
Continental Elevator Company	grain elevators	60
Datalog, Inc.	oil field service	35
The Dorsey Corporation		
Filter Media, Inc.	perlite products	20
Jones Chemicals, Inc.	chemicals	20
St. John Shipping Company		
Shelter Industries	construction materials	40
Mt. Airy		
Mt. Airy Refining Company	energy products	50
St. John - St. James Parish Line		
Kaiser Aluminum & Chemical Company	primary aluminum	1,030

Source: South Central Planning & Development Commission, 1979.

TABLE 3.3

St. John The Baptist Parish

Proposed Industry

Garyville		
Liquechemica of America	chemical products	100
LaPlace		
Bayou Steel	steel billets	625
Wallace		
Shell Chemical	chemical products	100
Reserve		
Browning-Farris Industries	truck repair facility	?
Continental Plastics	manufacturing warehouse	
Mississippi Valley Equipment	heavy equipment yard	

Source: South Central Planning & Development Commission, 1979.

TABLE 3.4

St. John The Baptist Parish

Employment By Industry, 1978

Occupation	Number of Employees
Agriculture, Forestry, Fishing	312
Mining	94
Construction	660
Manufacturing	2,293
Transportation, Communication, and Utilities	513
Wholesale and Retail Trade	1,111
Finance, Insurance and Real Estate	196
Services	992
Government	150
	TOTAL 6,321

Source: South Central Planning & Development Commission (1979).

OIL AND GAS EXPLORATION AND SUPPORT FACILITIES: THE COASTAL PARISHES

The other main type of industrial development prevalent in the South Central Region is that of direct and indirect exploration and support facilities associated with the locating, drilling and storage of oil and gas. This includes such activities as ship building (mainly barges and crewboats) catering, welding, machine shops, oil rig fabrication, etc.

The predominant factors that have in the past, and still do provide the stimulus for industrial location are:

1. Source of cheap transportation (water).
2. Location near the source of resources (oil, gas, sulphur, fish, shrimp, etc.).
3. Availability of land to build industries.
4. Lack (especially in the past) of governmental controls that would restrict development.

Of the total land/water acreage of 1,338,387 acres, 231,192 acres or about 17 percent of the total area is natural levee or drained wetland area (Louisiana State Planning Office: 1975).

The estimated 1980 population for Lafourche Parish is 76,537. Development here, as elsewhere in the district, is strip development, mainly along Bayou Lafourche. There are three incorporated communities in the parish. These are Thibodaux, Lockport and Golden Meadow. Of these, only Thibodaux is of substantial size (14,925 with an estimated area population of 20,000) (Mumphrey _et al_ 1976: 2-3 and Author).

Governmental

The parish is currently governed by the Police Jury system of government. After mid 1980, however, Lafourche will switch to a more sophisticated President-Council system of government. Each unincorporated community within the parish is under a variety of the Mayor-Council form of government.

Land use controls in the parish consist of Subdivision and Mobile Home Regulations, Flood Plain Regulations and, within a year, comprehensive Coastal Zone Management regulations. The cities of Thibodaux and Golden Meadow currently also have Zoning Ordinances in force.

Industrial Development

The parish can be broken down into these areas:

1. The northern agricultural area from the northern parish line to Raceland
2. The central transition zone from Raceland to Larose, north of the Intracoastal Waterway
3. The southern zone from Larose, south of the Intracoastal Waterway to the Gulf of Mexico

In the northern zone, agriculture and farm processing are the predominant industries. In the transition zone, both agriculture and related oil and gas industries exist. In the southern zone, industries related to oil and gas, and the fishing industry predominate.

Table 3.5 illustrates the main industries in Lafourche Parish. Note the concentration of fishing and oil and gas related industries in the southern portion of the parish.

Table 3.5

MANUFACTURERS IN LAFOURCHE PARISH (1972)

SIC Code	Location	Product Description	Number of Employees
2036	Leeville	fresh and frozen shrimp	20-49
2036	Golden Meadow	fresh and frozen shrimp	90-197
2042	Golden Meadow	animal foods	40-98
2051	Golden Meadow	bread and pastries	20-49
2499	Golden Meadow	travel boats	1-7
3599	Golden Meadow	machine shop, jobbing and repair	20-49
3732	Golden Meadow	boat repair	8-19
3711	Cut Off	amphibious tractors	20-49
3731	Larose	steel tugs, barges,push boats, shrimp boat building and repair	40-98
2061	Lockport	sugar and molasses	50-99
2086	Lockport	soft drinks	8-19
2621	Lockport	plup and paper	250-499
3731	Lockport	tugs, push boats, barges, offshore support vessels, marine repair	200-498
2061, 2	Matthews & Raceland	raw sugar, refined sugar black strap molasses	200-498
2329	Matthews & Raceland	sports clothing	50-99
2013	Thibodaux	slaughtering plant, sausages	50-99
2026	Thibodaux	milk products	20-49
2061	Thibodaux	raw sugar, molasses	200-447
2071	Thibodaux	candy	50-99
2086	Thibodaux	soft drinks	50-99
2751	Thibodaux	commercial printing	20-49
3443	Thibodaux	pressure vessels, storage tank	100-249
3522	Thibodaux	tractors, side hoe ditches	200-498
3599	Thibodaux	machine shop service for oil and sugar industries	50-99
3711	Thibodaux	draglines, personnel carriers, drill rigs	50-99
3732	Thibodaux	small boats	20-49

Source: Gulf South Research Institute, 1974: 32.

Tables 3.6, 3.7, and 3.8 illustrate the historical development of the oil, gas and sulphur industry in Lafourche Parish (Mumphrey et al 1976: p. 913).

Table 3.9 illustrates employment in related oil and gas activities in Lafourche Parish in the years 1964-1973.

Table 3.10 illustrates the trends in oil and gas production toward offshore Louisiana in recent years, as onshore resources have dwindled.

Fishing industry statistics for employment are listed in Table 3.11. Seafood landings are listed in Table 3.12 (see Chapter 7, Part I and Chapter 4, Part II of this report for more information on the fishing industry).

The preceding two examples are illustrative of the various kinds of industrial development in the SCP&DC region. Although difficult to predict, future trends appear to be:

1. Tightening of governmental restrictions at the local, state, and federal level regarding:

   a) air pollution
   b) water pollution
   c) solid waste disposal
   d) land use interaction

2. Slow decline in oil and gas related exploration activities in the lower parishes.

---

[1] It must be noted here that the author has noticed that many small associated industries in lower Lafourche Parish have not reported, or are not listed in the available surveys, thus resulting in an undercount of employees and industries.

TABLE 3.6

LANDMARKS OF RESOURCE DEVELOPMENT

IN LAFOURCHE PARISH

OIL

1902 First oil field in Louisiana began production at Jennings salt dome in Acadia Parish[1].

1922 First permit for exploratory drilling in Lafourche Parish issued by Minerals Division, Louisiana Department of Conservation[2].

1928 Leeville Dome discovered by seismograph[3].

1931 First commercial production of oil in Lafourche Parish at Leeville Dome began in February when Texas Company completed their first producing well. It produced 157, 675 barrels for the year[3].

1932 A second well (by Pop Oil Company) began producing 90 barrels daily, for a total production by the Leeville field of 267, 962 barrels for the year[4].

1933 Eight producing wells were completed at Leeville for a total production of 361,000 barrels[4].

1934 Fifty-two (52) producing wells were completed at Leeville Field. Total production was 4,329,572 barrels[4].

1935 Nine (9) new prodicing wells were completed at Leeville, increasing yearly production to 4,820,093 barrels[4].

1936 Oil production declined somewhat to 4,596,027 barrels[5].

1937 Producing wells were established at Harang Field and Lake Lond Field. Total production:

Harang	977,862 barrels
Lake Long	83,231 barrels
Leeville	2,651,187 barrels
TOTAL	3,712,280 barrels

1940 Lafourche Parish produced a total of 7,926,467 barrels (including condensate)[6].

1941 Lafourche: Parish produced 8,958,960 barrels[6].

TABLE 3.6 CONTINUED

1947	First offshore well in Louisiana started and completed by Kerr-McGee Oil Company in Ship Shoal Area off Terrebonne Parish[7].
1949	First oofshore well off Lafourche Parish, discovered by the California Company in Bay Marchand Field, was completed on March 3rd[7].
1970	Production of oil in Lafourche and offshore Lafourche was 117,674,244 barrels[8].
1971*	Production in Lafourche and smaller offshore area was 89,676,024 barrels[8].
1972*	Production in Lafourche and still smaller offshroe area was 58,548,420 barrels[8].
1973*	Production decreased in same area as 1972 to 53,022,060 barrels[8].

*Offshore area decreased because of increasing Federal jurisdiction offshore. These statistics were collected by the Louisiana Department of Conservaiton in its jurisdictional area.

Source: Mumphrey et al (1976) pages 10-11.

TABLE 3.7

LANDMARKS OF RESOURCE DEVELOPMENT

IN LAFOURCHE PARISH

NATURAL GAS

1909 Gas was discovered at the Monroe Gas Field in Ouachita, Morehouse, and Union Parishes, but the first commercial gas was not produced until 1916[3].

1916 The 1914-1916 Report of the Department of Conservation states that, "The total production of gas for the year 1915, as nearly as can be estimated, is 27,261,260,000 cubic feet . . . Formerely, no accurate records have been kept on the gas production and it is impossible to obtain positive information, except from the producers who have kept records of their production." In light of this, the earliest record of gas production in Louisiana that could be found was in 1912 from the Bull Bayou Field in DeSoto Parish[9].

1938 First natural gas to be produced in Lafourche Parish was at Leeville[10].

1939 Gas was alsp produced from fields at Raceland and Valentine (Harang) for a total production as follows:

Leeville	131,290 M.C.F.
Raceland	351,022 M.C.F.
Valentine	92,794 M.C.F.
TOTAL	575,105 M.C.F.

1940-1950 Production fluctuated, averaging approximately 16,600,000 M.C.F. for the period[11].

1948 First offshore gas discovered in the Grand Isle area.

1951-1968 Production increased steadily[12].

1969 Production of natural gas reached its peaks of 318,800,130 M.C.F. for the year[8].

1970-1973 Production dropped to 275,434,479 M.C.F. as offshore area for which data was provided gradually decreased*.

Source: Mumphrey et al (1976) pages 11-12.

TABLE 3.8

LANDMARKS OF RESOURCE DEVELOPMENT

IN LAFOURCHE PARISH

SULPHUR	
1927	Sulphur discovered at Chacahoula Salt Dome by Gulf Refining Company[14].
1955	First commercial sulphur production in Lafourche began on March 10 by the Freeport Sulphur Company.
1960	The world's first offshore sulphur mine began production in the Grand Isle area.
1962	Commercial production at Chacahoula ended in September.
1967	Sulphur production began again in Chacahoula.
1968	Production began at Bully Camp Dome by Texas Gulf Sulphur Company.
1970	Production stopped at Chacahoula, but continues at Bully Camp.
1973	Natural gas shortage and oversupply of sulphur results in reduced production at Bully Camp.

Source: Mumphrey et al (1976) pages 11-12.

TABLE 3.9

EMPLOYMENT IN OIL AND GAS RELATED

PRIMARY AND SECONDARY INDUSTRIES IN LAFOURCHE PARISH

SIC Code	Industry	1953	1956	1959	1964	1965	1966	1968	1969	1970	1971	1972	1973
	PRIMARY INDUSTRIES												
	Mining (total)												
	Employees	1602	1206	784	2149	1916	2207	1630	1146	1183	1070	1302	1245
	Payroll ($1000)	1664	1672	1277	3208	3128	3505	3384	2314	2600	2709	2455	3169
	Establishments	36	34	18	51	41	50	44	37	38	35	38	38
13	Crude Petroleum and Natural Gas												
	Employees		1206	D[2]	2149	1916	2207	D	D	1183	1070	1302	1245
	Payroll ($1000)		1672	D	3208	3128	3505	D	D	2600	2709	2455	3169
	Establishments		34	16	51	41	50	43	36	38	35	38	38
131	Crude Petroleum and Natural Gas												
	Employees		467	447	D	D	D	D	D	D	D	501	483
	Payroll ($1000)		713	806	D	D	D	D	D	D	D	1417	1456
	Establishments		10	10	16	12	20	10	8	11	10	9	9
132	Natural Gas Liquid												
	Employees				D	D	D	D	D	--	--	--	--
	Payroll ($1000)				D	D	D	D	D	--	--	--	--
	Establishments				2	1	1	2	2	--	--	--	--

TABLE 3.9 CONTINUED

SIC Code	Industry	1953	1956	1959	1964	1965	1966	1968	1969	1970	1971	1972	1973
138	Oil and Gas Field Services												
	Employees		739	D	1545	1354	1635	1116	621	678	562	801	755
	Payroll ($1000)		959	D	1990	2035	2311	2211	1068	1346	1315	1538	1702
	Establishments		24	6	33	28	29	31	26	26	24	29	28
1381	Drilling Oil and Gas Wells												
	Employees			D	765	D	871	750	312	307	228	321	299
	Payroll ($1000)			D	1346	D	1354	1618	559	566	522	528	665
	Establishments			5	16	12	14	11	9	7	7	8	7
1382	Oil and Gas Exploration Services												
	Employees					D							
	Payroll ($1000)					D							
	Establishments					2							
1389	Oil and Gas Field Services, n.e.c. (not elsewhere covered)												
	Employees				D	647	D	290	264	297	307	408	378
	Payroll ($1000)				D	861	D	522	461	708	775	954	954
	Establishments				15	14	13	15	13	14	14	18	17
44	Water Transportation												
	Employees		672	655	933	1100	1455	1557	1585	1869	1871	2076	2401
	Payroll ($1000)		507	587	971	1175	1707	2155	2271	2759	2893	3234	3746
	Establishments		98	123	130	132	152	146	141	157	166	181	192

TABLE 3.9 CONTINUED

SIC Code	Industry	1953	1956	1959	1964	1965	1966	1968	1969	1970	1971	1972	1973
445	Local Water Transportation												
	Employees			524	844	992	1335	1395	1412	1707	1764	1916	2137
	Payroll ($1000)			484	871	1049	1556	1935	2060	2528	2703	3001	3393
	Establishments			117	112	115	113	130	126	140	151	163	165
446	Water Transportation Services												
	Employees				74	D	D	D	D	D	D	148	202
	Payroll ($1000)				84	D	D	D	D	D	D	211	272
	Establishments				14	14	17	14	14	16	14	15	18
4469	Water Transportation Services, n.e.c. (not elsewhere covered)												
	Employees				74	D		D	D	D	D	148	202
	Payroll ($1000)				84	D		D	D	D	D	211	272
	Establishments				14	14		14	14	16	14	15	18
SECONDARY INDUSTRIES													
162	Heavy Construction, n.e.c. (not elsewhere covered)												
	Employees			D	D	221	226	463	108	199	171	212	111
	Payroll ($1000)			D	D	248	290	688	158	306	320	441	211
	Establishments			9	14	13	12	18	11	10	12	10	9

TABLE 3.9 CONTINUED

SIC Code	Industry	1953	1956	1959	1964	1965	1966	1968	1969	1970	1971	1972	1973
35	Machinery, Except Electrical (Manufacturing)												
	Employees		137	154	D	D	D		259	231	209	213	238
	Payroll ($1000)		135	150	D	D	D		399	366	359	376	444
	Establishments		3	5	2	4	4		5	6	6	7	8
37	Transportation Equipment												
	Employees				254	311	268	258	233	220	221	241	328
	Payroll ($1000)				273	338	403	402	399	367	428	518	617
	Establishments				14	12	10	11	12	9	10	10	11
373	Ships and Boats												
	Employees				D	D	D	D	D	D	D	D	160
	Payroll ($1000)				D	D	D	D	D	D	D	D	506
	Establishments				13	11	9	10	11	8	9	9	9
3731	Ship Building and Repairing												
	Employees							108	169	D	142	D	D
	Payroll ($1000)							136	298	D	306	D	D
	Establishments							4	5	3	3	3	4

TABLE 3.9 CONTINUED

SIC Code	Industry	1953	1956	1959	1964	1965	1966	1968	1969	1970	1971	1972	1973
3732	Boat Building and Repairing												
	Employees				156	193	191	D					
	Payroll ($1000)				177	218	262	D					
	Establishments				10	8	7	6					
508	Machinery, Equipment and Supplies (Wholesale Trade)												
	Employees											133	121
	Payroll ($1000)											203	244
	Establishments											11	11

NOTE: [1]These date are taken from County Business Patterns for the years indicated. The employment data from this publication does not include government employees, self-employed persons, farm workers, and domestic service workers. Also, railroad employment subject to the Railroad Retirement Act and employment on oceanborne vessels are not included (Bureau of the Census, 1973: 1). While these exclusions are not considered to seriously affect the figures for the industries, the exclusion of self-employed persons may cause these figures to be slight understatement of the actual employment. Also, the exclusion of government employees has resulted in a failure to note the effect of OCS development on relevant government agencies, such as the U.S. Geological Survey and the U.S. Army Corps of Engineers.

[2]Figures withheld to avoid disclosure of operations of individual units.

Source: Mumphrey et al (1976) p. 15-19

TABLE 3.10

PERCENT OF OFFSHORE OIL AND GAS PRODUCTION IN THE HOUMA DISTRICT[1]

	1958	1959	1964	1965	1966	1967	1968	1969	1970
Crude Oil and Condensate	21.0%	18.6%	37.6%	39.1%	42.9%	44.1%	48.0%	52.3%	54.4%
Casinghead and Natural Gas	10.0%	13.1%	12.6%	14.1%	17.3%	18.8%	21.6%	24.6%	30.5%

[1]This table indicates the increasing importance of offshore production. The percentages were computed from the production statistics of the Louisiana Department of Conservation. The 1958 and 1959 figures refer to offshore production in the South Louisiana area, while the 1964-1970 figures are for the offshore production in the Houma district, which includes the parishes of Terrebonne, Lafourche, Assumption, St. Charles, St. John the Baptist, St. James, and parts of St. Martin, Iberia, Iberville, and Ascension parishes. It also includes the offshore areas of Ship Shoal, South Pelto, South Timbalier, Bay Marchand, and Grand Isle.

After 1970, the federal government assumed jurisdiction for a portion of the Houma District. The Department of Conservation figures for offshore production after 1970 include only a portion of the total offshore production and it was decided not to include them in this table.

Source: Murphey et al (1970) page 75.

TABLE 3.11

EMPLOYMENT IN SEAFOOD INDUSTRIES IN LAFOURCHE PARISH FOR 1975-1976 BY QUARTER*

SIC Number	Description	1975-1	1975-2	1975-3	1975-4	1976-1
0910	Commercial fisheries	86	109	120	118	79
0912	Finfish	5	5	10	7	10
0913	Shellfish	90	129	154	139	126
0989	Fish hatcheries, farm, and preserves	8	13	15	18	10
	TOTAL	189	256	299	282	225

*Because of disclosure problems relating to single-firm industries, Table 3.11 should not be further reproduced without the permission of its source.

Source: Murphrey et al (1976) page 166.

TABLE 3.12

COMMERCIAL SEAFOOD LANDINGS

FOR GOLDEN MEADOW-LEEVILLE PORT

Year	Size (1000 lbs.)	Value ($)
1972	37,900	9,100,000
1973	32,565	8,626,000
1974	26,819	8,000,000
1975	23,395	11,260,000

Source: Murphrey et al (1976) page 167.

3. Continuing industrial expansion in the "River Parishes".

4. Relative stability in the fishing industry.

5. Increasing land use conflicts as industry competes for space with other development (especially in the "River Parishes").

Conflicts in land use between Industry, Population and Agriculture are discussed in the next chapter.

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CHAPTER 4 - CONFLICTS IN LAND USE

By

Edwin J. Durabb

INTRODUCTION

In the South Central District there are many conflicts between the land uses of man and the natural system. There are also conflicts between the resource uses to which the land has been put in our district. This is not an unusual situation in that every area of the country has conflicts in utilizing the land and its resources without destroying the integrity of the natural order. What is unique here is the dynamic and fragile ecological and geomorphic system that exists in the landscape. The very fact that we inhabit and modify this area has profoundly changed the evolution of this landscape. Conversely, the local environment has largely shaped what we do and how we do it in response to the natural constraints of the land.

This chapter attempts to identify conflicts, explain them and investigate what is currently being done to resolve competing land uses. The main areas of conflicting uses involve the following:

A. Uses of the Land Versus The Environment

1. Utilizing the Natural Levees

    a. flood protection costs to man
    b. flood protection costs to the environment

2. Utilizing the Wetlands Area

    a. reclamation
    b. harvesting natural renewable resources
    c. recreation
    d. transportation.

B. Conflicts Between the Uses of Man

1. The Natural Levee

   a. agriculture versus urban expansion
   b. agriculture versus industrial and commercial development
   c. residential versus industrial development
   d. waste disposal, pollution.

2. Wetlands

   a. oil and gas exploration versus the fishing industry
   b. reclamation
   c. mitigation

These conflicts will be examined and discussed in the following sections of this chapter. The conflict descriptions related here are primarily verbal non-quantitative discussions of the problems in land utilization between man and nature and various uses of man. In the next phase of this report, statistical land use comparisons and change assessment will be made to document the problems identified in this chapter.

USES OF THE LAND VERSUS THE ENVIRONMENT

Utilizing the Natural Levee

Flood Protection Costs To Man

As mentioned in Part I of this report eighty-one percent of our district is classified as wetlands or water. The other nineteen percent is either reclaimed or "natural levee" lands that are normally dry. In either case, extreme methods must be taken to keep our land dry and protect the residents who live here.

History

As soon as settlers began to carve out the local wilderness, it became apparent that coexistence with the natural order would be difficult at best. The same river that built the fertile land of the area flooded almost yearly, depositing lifegiving silt, but in the process destroying lives and property. Efforts to modify the natural system for flood protection began quite early in the recorded history of the area:

> French settlers were the first recorded builders of flood control works in the Lower Mississippi Valley. It was in 1717 that the founder of New Orleans, Sieur Jean de Bienville, had his engineer, Sieur de la Tour, construct a series of protective levees to hold back the floodwater from the town.
>
> By 1735, the levee lines on both sides of the river extended from about 30 miles above New Orleans to about 12 miles below the city. Floods alternated with progress on the system, but, by 1812, levees extended upriver to Baton Rouge on the east bank and about 40 miles beyond Baton Rouge on the west bank. By 1849, the west bank levees reached almost as far up as the Arkansas River in an almost continuous line, and isolated levees had been built along the east bank to protect land in the Yazoo Basin of Mississippi.
>
> U. S. Army Corps of Engineers, (1970).

These levees helped protect the people who lived on the delta, but could not contain severe floods along the river. Levee building continued off and on into the twentieth century, but this was still not enough to protect the residents from flooding. The disastrous river flood of 1927 covered 26,000 square miles of the Mississippi Valley and spurred Congress to pass the Flood Control Act of 1928 mandating Federal involvement. From that date to the present, billions of federal dollars have been spent to protect the Mississippi Valley and Delta area from flooding.

Protective measures include levees along the Mississippi that top twenty-five feet in height and flood control structures to divert Mississippi River water during periods of severe flooding. In Louisiana, Flood control structures at the "Old River", "Morganza" and "Bonnet Carre" divert millions of cubic feet of river water during floods. Figure 4.1 illustrates the intricate system of revetments, dikes, spillways, levees and artificial cutoffs that have been executed to prevent major flooding here as well as in the Upper Mississippi Valley.

Local flooding from rainfall and the local share of levee construction must be borne by the local taxpayer. In addition to the river, lower portions of the natural levees are vulnerable to flooding from hurricane storm surges. Thus, "back levees" must be built to protect the rear areas from this danger, and pumps must be utilized to secure water trapped inside the system.

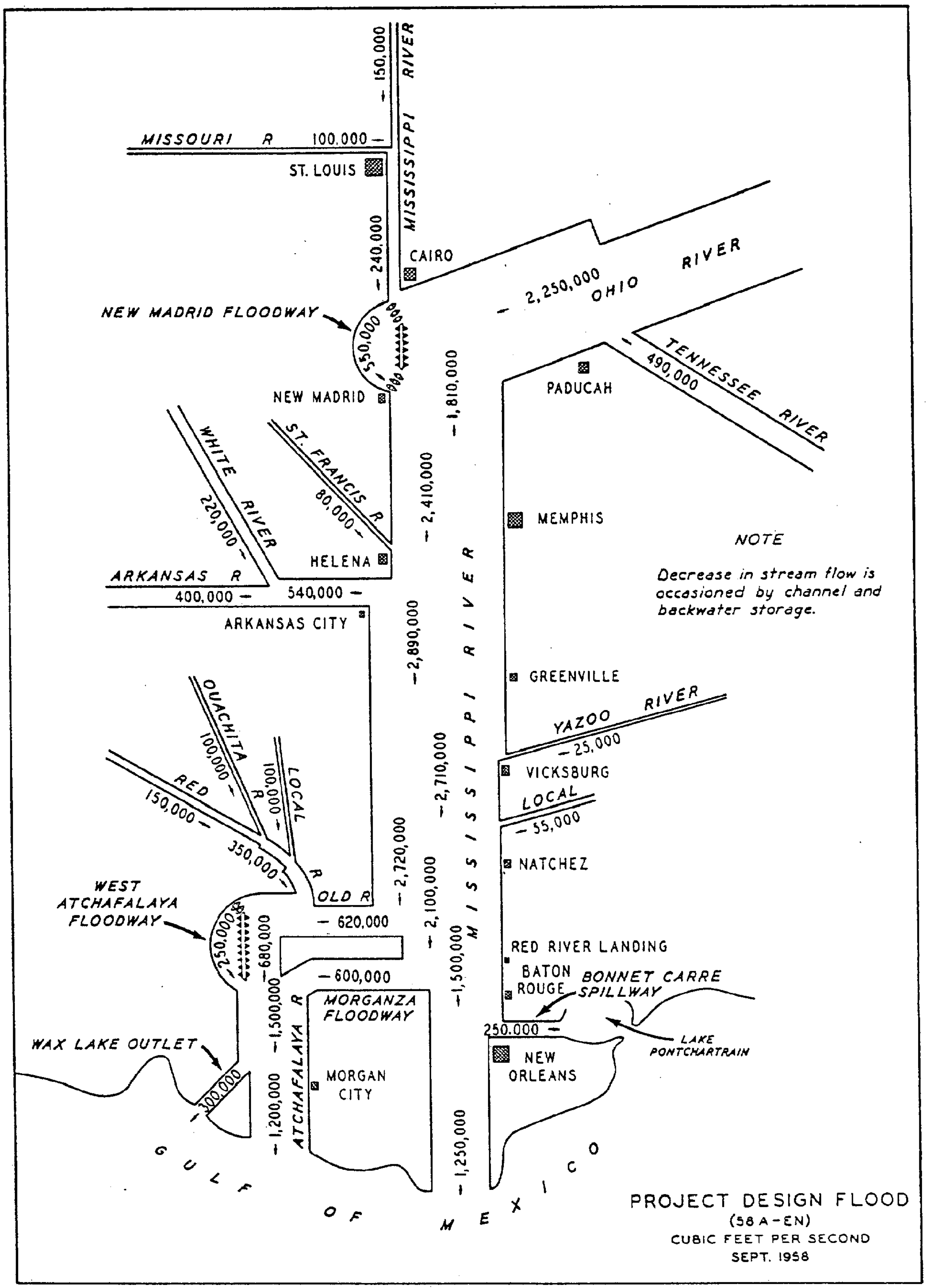
Flood Protection Costs to the Environment

Man has largely protected the natural levees from flooding by the Mississippi River overflow and storms from the Gulf of Mexico. This protection, however, has had disastrous impact on the ecosystem. Prevention of flooding by the Mississippi system has had the following negative effects:

1. Loss of freshwater to the estuary system

   a. lack of flushing of the system
   b. reduced capacity to assimulate pollutants
   c. increased salinities in the lower basins
   d. loss of natural source for the estuary

FIGURE 4.1



Source: U. S. Army Corps of Engineers, (1973) p. 11.

2. Loss of Silt and Clay Deposition

   a. cessation of land building
   b. loss of needed nutrients in the estuary
   c. contributing factor to rate of land loss in the coastal zone

In Chapters 5 and 7 of Part I of this report, the vegetation and ecosystem function of the estuary systems was discussed. Freshwater and silt are needed components to maintain the system. As the river shifts its course, there is always land loss on the old delta and land gain in the new deposition area. Without new silt, however, there is little or no land gain (since the River currently has been channeled to the point of dumping its silt load off of the continental shelf and not across its deltaic plain.

The only freshwater input into the system is gotten from rainfall, natural levee runoff, urban runoff and canal leakage (mainly navigation canals on the Mississippi River). This water amount is miniscule when compared to what came before levee construction. This freshwater is also polluted with urban and agricultural wastes causing eutrophication (choking of a body of water by the natural or artificial introduction of nutrients) of the lakes near urban or agricultural areas. Craig and Day (1973), have documented the detrimental effect this has had on the Barataria Basin, an area responsible for forty-five percent of the State's total commercial fish harvest.

Utilizing the Wetlands Area

This section will deal with the effects of man's use of the vast areas of wetlands within the South Central District on the natural system on our region. Habitation of wetland areas and resource use conflicts will be the two topics of discussion since they constitute the largest impacts on the natural system in our area.

Reclamation

It is impossible to build waters, cities or accomplish any other intensive activity in a wetland area in its natural state. Therefore, very early in the history of settlement of the region, efforts were made to "reclaim" land areas from their natural wet condition, drain them and utilize the area for an intensive activity usually farming or urban type development. Such land once drained was called "first land". It was protected from frequent flooding and therefore suitable to use for man's activities.

When land is reclaimed, several negative effects occur on wetlands. These are all related to the loss of land to the estuary. These are:

1. irreversible loss of land to the estuary
2. loss of habitat for birds, fish, etc.
3. Loss of nursery area for birds and fish
4. loss of "detritus" providing area to the estuary
5. eventual drop in estuarine productivity in the absence of any compensating factors.

The function of the wetlands ecosystem has been discussed in Part I of this report. Draining of these wetlands cause subsidence because of the withdrawal of water from the soil and oxidation of peat deposits (accumulations of partially decomposed vegetable matter). Thus, even if artificial levees were eventually torn down and the pumps turned off, the area would revert to open water, not wetland, thus causing the effects listed above on the ecosystem.

Reclamation Projects in the South Central District

Most of the reclamation in the South Central District has been for agricultural purposes (see Table 4.1). Very little wetland has been altered for urban use in our district. This contrasts sharply with the adjacent New Orleans Area, where roughly 102 square miles of wetland in Orleans and Jefferson parishes have been converted to mainly urban areas (Mumphrey, et al, 1975).

Harvesting Natural Resources: Channelization

Much damage has been done to the wetlands of the South Central District for the sake of harvesting our natural resources. This includes the mining of sulphur, salt, oil and natural gas, general navigation, fishing, and drainage. Table 4.2 lists the amount of land that has been taken up in our wetlands of Louisiana by channelization.

Canals cause several problems to the Wetlands through which they are dug. Some of the problems are:

1. interfering with sheetwater flow through the marsh
2. allowing rapid salinity change with resultant death of vegetation and erosion (widening of the channel) of the marsh
3. allowing destruction of the marsh by wave action
4. decreased productivity by the presence of straight versus sinuous channels that accelerate removal of freshwater and also confine water movement (and detritus)

TABLE 4.1

"Major Reclamation Projects

in the South Central District to 1961"

1. St. Charles Municipal Drainage District No. 1, also known as Sunset Drainage District; about 10,000 acres. (Several projects started in this area in early 1900's; only one remains.) Flood overflowed district in 1912. Drainage local and inadequate. Only 25 to 30 percent of land in agriculture, used mainly for pasture and forage crops. Land now owned by corporation, and oil deposits being developed. Once settled by Corn Belt farmers; all of them now displaced. (See Allemands Quadrangle, U. S. Geological Survey.)

2. St. Charles Drainage District No. 1 (1910); 2,800 acres. Drowned fields now used by duck hunting club.

3. Lafourche Drainage District No. 6 (1910); 1,800 acres. Drowned fields not used by duck hunting club. (See Allemands Quadrangle, U. S. Geological Survey.)

4. Lafourche Drainage District No. 12; 8,265 acres, composed of subdistricts listed below. Part of project is above local water level and has loamy soil favorable for corn. Lower areas never suitable for small farmers. Corn Belt farmers failed. No intensive use of land developed and corn remains principal crop, although some grass seeds have been produced. (See Houma Quadrangle, U. S. Geological Survey.)

5. Subdistricts 1, 2, 3 of Lafourche Drainage District No. 12 (1907); 835, 940, and 2,250 acres respectively. Small farms at first sold to Corn Belt farmers who failed. Small farms in area took over but have not made success of farming. No high-value crops produced, and high drainage taxes met with difficulty. Now extensive repairs and renovations necessary and no money for this work is in sight.

6. Subdistrict 4 of Lafourche Drainage District No. 12 (1913); 41,240 acres. Became the property of engineering company which developed Nos. 7 and 8 above. Operated as private holding along plantation lines, specializing in beef cattle. Serves as kind of luxury farm on which expenses have been heavy, profits from agriculture rare and subsidies have been common. Oil now helps sustain operations.

7. Smithport Plantation (1907); 847 acres. Original drainage reservoir capacity inadequate and so was enlarged. For a time land was well drained, although tropical storms did serious damage and hindered pumping operations. Serious condition of soil acidity developed after several years of farming. Project now abandoned. (See Houma Quadrangle, U. S. Geological Survey.)

8. Lafourche Drainage District No. 13, Subdistrict No. 1 (1914); 2,000 acres. Development cost underestimated and project abandoned after spending funds from $60,000 bond issue. (See Houma Quadrangle, U. S. Geological Survey.)

9. Delta Farms (4 units) (1910-1913); acres range from 600 to 3,000 acres. Three smallest units abandoned, one of them now serving duck hunting club. Large unit of 3,000 acres survived with heavy losses and subsidies. Changed ownership several times and is now owned by corporation. Owners interested in oil prospects. Operated as stock farm; corn main cultivated crop. Levees and drains in deteriorated state. One of two major pump projects that survives.

10. Clovelly Farms, Subdistrict No. 1 of Lafourche Drainage District No. 20 (1916); 2,500 acres. Private reclamation developed by Northern man as demonstration project. At first operated under tenant system, which failed; now operated under central management. Problems similar to those of other projects but efforts to succeed more persistent. Newly drained land was difficult to cultivate. Bogshoes on horses and special plowing equipment were used. Seven to eight years elapsed before soil was sufficiently dry to be plowed readily and by that time soil was so acid that crop production seemed impossible. Sulphates left by sea water turned acid as they decomposed. Application of lime offered only partial relief. 12 to 16 tons of calcareous sand applied per acre and mixed with peat soil to improve its structure. Now potatoes, corn, cane, cotton and several vegetable crops are grown. Pasture and livestock programs are small. It is still difficult to keep the project out of the red and much investment must be charged to experimentation.

11. Avoca Drainage District (1912); 13,200 acres. Project seriously damaged by flood of 1927. Over one-half million dollars spent on project. Fields are now flooded and serve duck hunting club.

12. Upper Terrebonne Drainage District (1912); 4,240 acres. Storms and seepage proved major problems as dis disagreements between settlers and land development company. Project abandoned.

Source: Gagliano (1973) p. 14-17.

5. destruction of Barrier Islands with resultant increased destruction of marsh
6. introduction of urban and agricultural pollutants to retard life processes and cause deterioration in the vegetation.

One of the prime requirements for our estuarine basin is slow water "sheetflow" that allows gradual mixing of salt and fresh water, good nutrient exchange between wetlands and water, and permanent water cover to protect wetland soils from oxidation and subsidence. Canals short circuit all of these functions by their straightness, depth, and spoil banks. Canals through barrier islands interrupt sand transport flows, causing erosion of the islands that protect the fragile wetlands behind them. Death of vegetation near canals makes the loose organic soil highly vulnerable to erosion. The result of this process is accelerated land loss in the wetlands areas.

Gagliano and Van Beek (1970) have calculated land loss in coastal Louisiana to be about 16.5 square miles per year and accelerating. Gagliano (1973) has also estimated that roughly 45 percent of this land loss was due to man-made features. Table 4.2 summarized land loss from natural and man-made sources. Figure 4.2 graphically illustrates areas of land loss in coastal Louisiana. From this and other studies, it is evident that land loss is high and increasing in rate over time. The man-produced features that cause land loss will eventually hasten the deterioration of ecosystems at a much faster rate than the natural system operating alone and unincumbered (i.e. natural deterioration of abandoned delta's). Although the fishing industry and other mineral activities (salt and sulphur) have contributed to man-made land loss,

TABLE 4.2

Surface Area of Natural and Manmade Water Bodies, 1931-1942, 1948-1967, and 1970

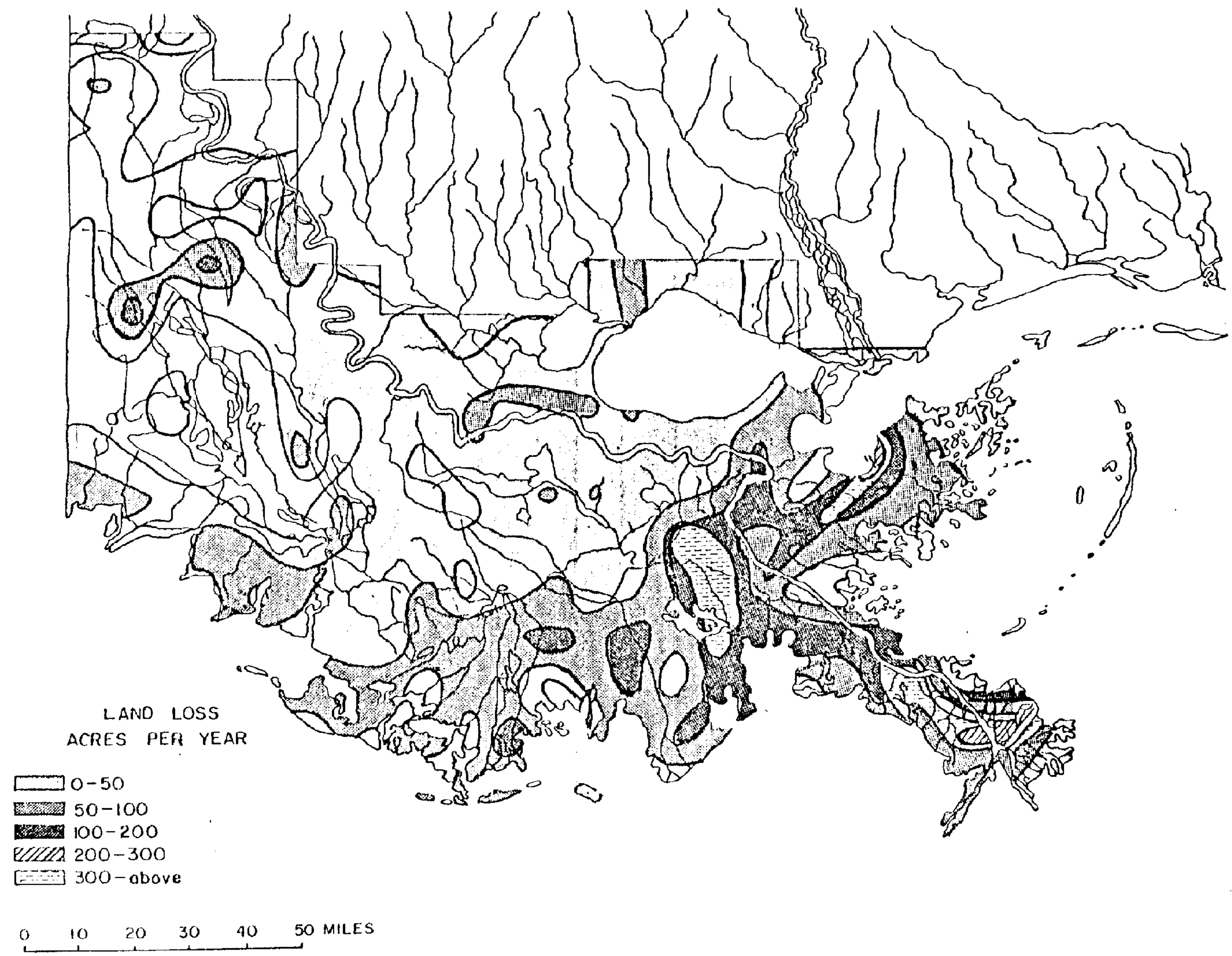
Date or Interval	Total Water Area Mi^2	Natural Water Bodies Mi^2	Manmade Water Bodies Mi^2	Canals Mi^2	Ponds Mi^2
1948-1967 maps	6608.17	6381.12	227.05	189.13	37.93
1931-1942 maps	6231.82	6175.25	56.57	40.28	16.29
	376.35	205.87	170.48	148.85	21.64
1970 (Projected)	6797.98	6505.31	292.67	245.87	46.80

Elapsed period between the average date of the two series of maps from which the measurements were taken equals 22.8 years. Using the figures above and this elapsed time the following rates can be calculated:

Total rate of land loss	16.51 mi^2/year
"Natural" land loss	9.03 mi^2/year
Manmade land loss	7.48 mi^2/year
Land loss attributed to canals	6.53 mi^2/year
Land loss attributed to ponds	.95 mi^2/year

Source: Gagliano (1973) p. 9.

Figure 4.2



Source: Gagliano and Van Beck (1970)

the oil and gas industry and general navigation canals have been the major cause of this deterioration.

Recreation

This activity has been of relatively minor impact on wetlands areas. This chief negative effect is that of pollution of waters near large numbers of camps from sewerage and solid wastes.

Transportation

Much damage has been done to wetlands by transportation systems, especially highways, both directly and indirectly. Table 4.3 lists highways in the South Central District that cross wetlands areas.

The construction of these highways through wetlands areas directly destroy wetlands and blocks drainage. Indirect effects are the stimulation of reclamation development. Access is an important factor in any reclamation project. The roadway provides such access.

Railroads have also spurred reclamation efforts but to a far less extensive degree.

CONFLICTS BETWEEN THE USES OF MAN

The Natural Levee

Agriculture Versus Urban Expansion

Since the population of our region is growing, and only eighteen percent of our land area is not wetland or water; and since commercial and industrial land uses have expanded; and since the entire land area of the natural force has been utilized; and since the natural levees are not getting any larger, it is logical to assume that some of the uses of

TABLE 4.3

Highways Crossing Wetlands Areas

In The South Central District

U. S. Interstate	10
U. S. Interstate	55
U. S. Highway	90
LA Highway	1
LA Highway	20
LA Highway	307
LA Highway	309
LA Highway	398
LA Highway	24
LA Highway	70
LA Highway	315
LA Highway	57
LA Highway	56
LA Highway	55
LA Highway	665
LA Highway	401
LA Highway	402

Source: Louisiana Department of Public Works (1974).

man will suffer in relation to others given these parameters. Agriculture has been that land use. The soaring value of land in the South Central District and the economic woes of sugarcane farming (see Part II, Chapter 2) have made it quite attractive to sell good farmland for other uses.

Agriculture Versus Urban Expansion

Although expanding cities and non-urban residential expansion is a problem everywhere, the previous, limited levee soils with their good drainage and high elevation are prime candidates for residential development. Tremendous expansion has taken place in the unincorporated areas of LaPlace, as well as near Houma and Thibodaux in the South Central District.

St. Charles Parish is beginning to feel the same pressure as urban expansion from the New Orleans Metropolitan Area spills over into the parish. It is expected that when the new Luling bridge across the Mississippi River connecting up with I-10, U. S. 61, and the soon to be widened Highway 90 is completed, New Orleans and Jefferson Parish residents wishing to relocate in St. Charles Parish will have easy access and hasten the demise of the agricultural area of St. Charles Parish.

Agriculture Versus Industrial and Commercial Land Uses

Another pressure on agriculture land uses is that of industrial development. Chapter 3 of Part II of this report outlined the tremendous expansion of the oil and gas exploration, stripping, refining and storage areas within the South Central District since World War II. Ancillary to that development have been the new petrochemical industries located among what has been called the "Ruhr Valley of the South". All of these industries are interested in cheap water for industrial use and transportation. Therefore, they locate near the river on the crests of the natural levees where the good agricultural land used to be.

The main concentrations of industry in the South Central District are located along the Mississippi Rver in the parishes of St. Charles, St. John, and St. James. Industry is also concentrated around Houma, Louisiana and along Bayou Lafourche, especially south of the Intracoastal Waterway (see Chapter 3, Part II).

Residential Versus Industrial Development

Due to the tremendous growth of the region, limited "natural levee" development area, expanding heavy industrial base, and lack of adequate land use controls, conflicts have arisen between residential development and industrial uses in the South Central region. This conflict situation has occurred primarily in the Mississippi River parishes where, often heavy industries such as bulk terminals or chemical plants exist side by side with residential development.

Some of the problems listed by residents living near to heavy industry include:

1. Dust, other particulates settling over residential areas from plants, especially bulk storage facilities.
2. Excessive noise from transportation and processing activities at all hours of the day and night.
3. Destruction of residential through streets due to heavy machinery in or near residential areas.

4. Regular transportation of dangerous materials in or near residential areas.
5. Air pollution from plants and pollution of waterways with toxic or hazardous wastes.

Several accidents with hazardous wastes have been reported and evacuations of residents have been necessary at times during these emergencies.

Uneven enforcement of air pollution regulations and occasional disregard of these regulations regarding dumping and air emissions have caused numerous complaints.

Unfortunately, lack of land use controls such as good zoning laws at the local level have allowed plants to build near or right next to residential areas in the past. Likewise, developers have built subdivisions adjacent to existing industries without regard to the consequences.

Parishes have recently recognized this problem and are attempting to regulate future industrial and residential growth through the standard methods of land use control available to them. They have also enlisted the State to enforce air quality regulations, and dumping and water pollution programs in the area. The State is developing hazardous waste and solid waste management plans to regulate the transportation and disposal of waste or hazardous substances. These activities and awareness of problems should eliminate, or at least minimize future problems in this area.

Waste Disposal and Pollution

There are currently twenty-three solid waste disposal sites in the South Central District. Table 4.4 lists these sites by Parish.

TABLE 4.4

Parish	Number of Land Disposal Sites	Number of Sanitary Landfills	Open Dumps	Number with Burning
Assumption	2	0	2	0
Lafourche	6	3	3	2
St. Charles	6	4	2	2
St. James	3	0	3	3
St. John	2	1	1	1
Terrebonne	4	0	4	2

Source: Office of Science, Technology and Environmental Policy (1979) page 6.

Note: No sanitary landfill within the SCP&DC district met state requirements as of July 11, 1979.

Due to the Federal regulations such as the Federal Water Pollution Control Act, the Coastal Zone Management Act, and the Resource Conservation and Recovery Act, disposal in wetlands areas (formerly used intensively for landfills) is prohibited. As in other uses of man, the natural levee provides the soils and cover necessary to operate a waste disposal site. Thus, there is another competing land use on the natural levee.

The State of Louisiana is also cracking down on the many illegal open dumps in the region under solid waste management plan, developed in response to the Federal Legislation. Parishes are now being forced to operate stringently controlled waste sites on good natural levee soils.

Some problems in disposal of waste in the South Central District are:

1. high cost of land
2. high cost of operating a waste disposal site that meets regulations
3. location of sites away from human habitation
4. water pollution from leakout from improper sites
5. destruction of agricultural land

Resource recovery has been investigated as an alternate to landfills but the population density of the region is not yet high enough to make this method cost effective throughout the region.

Hazardous waste is a real problem in an area rich as ours with many petrochemical plants moving highly dangerous chemicals. These too are stored in sites, legal and illegal, across the district. Currently the state, regional planning commissions, and parishes are studying the problem of what to do with the transportation and storage of these wastes, so as not to pollute the environment and/or endanger the health of the general population.

Water Pollution

This area like others across the country, has had to grapple with the problems of degradation of water quality due to water pollution. Water pollution in our district results from the following sources:

1. out of district sources, principally the Mississippi River
2. pollution from municipal sewerage and drainage water
3. industrial pollution
4. agricultural runoff
5. septic tank effluent
6. pollution from crop

The Mississippi River, draining two-thirds of the continental United States, is a major source of water pollution. Most of the district derives their drinking water from the river either directly or indirectly via pumpage down. Bayou Lafourche industries also use the water in their processes, where it is then discharged back into the system after use.

There is currently no parish that has a "parish-wide" sewerage disposal system. Table 4.5 lists the communities within the south Central District and their current methods of sewerage disposal.

Although many areas are served by at least primary sewerage treatment, the facilities are often inadequate, outdated and violate Federal or State pollution guidelines. Many areas are still on private

TABLE 4.5

Sewerage Disposal Methods

SCP&DC District

Public Entity	Sewerage System
Assumption Parish	Septic tanks
Gramercy (St. James)	Sewerage System
Golden Meadow (Lafourche)	Septic Tanks
Lafourche Parish	Septic Tanks
Lutcher (St. James)	Sewerage System
Houma (Terrebonne)	Sewerage System
Lockport (Lafourche)	Sewerage System
St. Charles Parish	Sewerage/Septic Tanks
St. John Parish	Sewerage/Septic Tanks
St. James Parish	Sewerage/Septic Tanks
Thibodaux (Lafourche)	Sewerage System

Source: South Central Planning & Development Commission, (1977) pages 128-142.

*Note: Parish data excludes unincorporated municipalities. They are treated separately.

septic tank disposal systems on soils that have a limited capacity to accommodate them. Some subdivisions have small "package" plants that deal with sewerage with varying degrees of success

Currently drainge water from urban (or rural) areas is not being treated. These waters carry septic tank leakage effluent plus all kinds of pollutants washed off of city streets.

Industrial and agricultural pollution are an inportant, but diminishing problem. Industries discharge mainly into the Mississippi River and are now being regulated. Agricultural pollution is caused by fertilizer and pesticide residues in runoff into wetlands. This too is now under regulation and a diminishing problem.

Concentration of camps in wetlands areas cause a local health hazard because water flows are low and incapable of handling large volumes of sewerage. Camps often have no sewerage and pollute these areas.

The water pollution problems have cleared up considerably with public awareness and money available from the Federal government to help address problems. Sewerage plants have been built and refurbished, industrial effluent has been curtailed on quantity and concentration and regulations have limited "non-point" source discharges such as fertilizer or pesticide runoff.

WETLANDS

Oil and Gas Exploration/Navigation Activities

Negative Effects

As mentioned in the section of this Chapter on channelization, oil and gas exploration and development have had a profound effect on wetlands. Besides doing ecological damage by causing erosion, loss of wetlands, destruction of vegetation, etc., to the natural system, several negative aspects of this activity have hurt man. Channelization of wetlands causes:

1. vegetation destruction causing loss of habitat, nursery area and decreased productivity of commercial and recreational species of animals
2. saltwater intrusion that poisons municipal water supplies
3. water pollution decreasing productivity of commercial and recreational species, and hurting the fishing industry
4. land loss causing increased flood hazards to coastal communities
5. the flooding of waters from hurricanes to reach inland communities quicker and with greater height
6. loss of wetlands causing loss of part of a system that assimilates pollutants from and can serve as effective sewerage treatment

Economic Value of Wetlands

If these effects go, they eventually will adversely affect the commercial fish harvest offshore. Tables 4.6, 4.7, 4.8, 4.9, 4.10, and 4.11 list some of the tremendous productivity of the wetlands for fish and trapping activities. Tables 4.12, 4.13 and 4.14 list the total estimated value of wetlands in one Louisiana estuarine basin, to man. As can easily be seen, wetlands provide tremendous amount of benefits, directly and indirectly to man. Therefore, loss of these lands through channelization adversely affects the economic well being of our entire region.

TABLE 4.6

Fish And Shellfish Landings And Value For Louisiana

1966-1976

Year	Total Landings (Lbs.)	Total Value (1977 Dollars)	Average Price Per Pound (1977 Dollars)
1966	647,416,500	$ 73,481,772	$ .1135
1967	620,427,500	$ 68,065,284	$ .1097
1968	763,968,600	$ 75,174,510	.0984
1969	1,013,484,600	64,761,666	.0639
1970	1,115,331,700	97,368,457	.0873
1971	1,377,013,051	76,424,224	.0555
1972	1,081,269,660	104,234,395	.0964
1973	1,040,769,832	130,203,683	.1251
1974	1,233,415,909	108,047,234	.0876
1975	1,128,274,979	99,513,853	.0882
1976	1,232,328,343	147,016,771	.1193

Source: National Marine Fisheries Service, 1967-77.

TABLE 4.7

Percentage of Trapping Harvest

From Louisiana Wetlands

(By Species)

Species	Percentage
Muskrat	99.8
Nutria	99.1
Mink	70.4
Raccoon	71.3
Otter	92.0
Opossum	88.0
Bobcat	42.9

Source: U. S. Army Corps of Engineers, 1977.
Mumphrey, *et al* (1978).

TABLE 4.8

Average Annual Harvest Of Pelts

From Louisiana Wetlands

(By Species)

1970-1971 Through 1974-1975

Species	Average Annual Harvest
Muskrat	406,696
Nutria	1,462,075
Mink	22,707
Raccoon	90,007
Otter	5,525
Opossum	16,379
Bobcat	206
Total	2,003,995

Source: U. S. Army Corps of Engineers, 1977.
Mumphrey, et al (1978).

TABLE 4.9

Annual Harvest Of Pelts In Louisiana

(All Species)

1967-1968 Through 1975-1976

Year	Number Of Pelts	Average Price Per Pelt (1977 Dollars)	Estimated Total Value (1977 Dollars)
1967-68	2,130,473	$ 2.4152	$ 5,145,518.39
1968-69	3,469,040	3.0112	10,445,973.25
1969-70	3,002,043	3.2597	9,785,759.57
1970-71	2,090,761	3.3609	7,026,838.65
1971-72	1,732,682	4.8662	8,431,577.15
1972-73	2,180,332	6.2821	13,697,063.66
1973-74	2,304,916	6.9605	16,043,367.82
1974-75	2,038,379	5.7881	11,798,341.49
1975-76	2,533,500	5.4533	13,815,935.55
Average	2,386,903	$4.5997	10,979,037.73[1]

[1]Derived by multiplying the average number of pelts (2,386,903) by the average price per pelt ($4.59997).

Source: Louisiana Wildlife and Fisheries Commission, 1977.
Mumphrey, et al, 1978.

TABLE 4.10

Average Annual Pounds of Meats

From Louisiana Wetlands

(By Species)

1970-1971 Through 1974-1975

Species	Average
Muskrat	279,440
Nutria	9,116,750
Raccoon	376,464
Opossum	146,080
Total	9,918,734

Source: U. S. Army Corps of Engineers, 1977.
Mumphrey, *et al* (1978).

TABLE 4.11

Annual Harvest Of Meats

From Furbearing Animals In Louisiana

(All Species)

1967-1968 Through 1976-1977

Year	Number Of Pounds	Average Price Per Pound (1977 Dollars)	Estimated Total Value (1977 Dollars)
1967-68	9,220,000	$ .1667	$ 1,536.974.00
1968-69	11,660,000	.1625	1,894,750.00
1969-70	10,480,000	.1393	1,459,864.00
1970-71	8,770,000	.1324	1,187,628.00
1971-72	8,970,000	.1288	1,155,336.00
1972-73	11,300,000	.1310	1,480,300.00
1973-74	12,550,000	.1486	1,864,930.00
1974-75	10,430,000	.1375	1,434,125.00
1975-76	11,136,000	.1369	1,524,518.40
1976-77	3,635,000	.1883	684,470.50
Average	9,815,100	.1472	1,444,782.72[1]

[1]Derived by multiplying the average number of pounds of meats (9,815,100) by the average price per pound (.1472).

Source: Louisiana Wildlife and Fisheries Commission, 1977.
Mumphrey, et al (1978).

TABLE 4.12

Estimated Gross Economic Contribution

Of A Wetland Acre In The Barataria Basin

Activity Category	Annual Return Per Acre	Present Value Per Acre
Commercial Fishing	$ 286.36	$ 5,540.42
Non-Commercial Fishing	$ 3.19	46.40
Commercial Trapping (Pelts & Meats)	11.69	170.05
Recreation:		
Economic Impact of Recreation Expenditures	60.08	873.89
Economic Value of User-Benefits from Recreation	104.33	2,428.17
Totals	$ 465.65	$ 9,058.93

Source: Mumphrey, *et al* (1978).

TABLE 4.13

Estimated Net Economic Contribution

Of A Wetland Acre In The Barataria Basin

Activity Category	Annual Return Per Acre	Present Value Per Acre
Commercial Fishing	$ 26.45	$ 384.73
Commercial Trapping (Pelts & Meats)	1.91	27.84
Recreation Economic Value of User-Benefits	104.33	2,428.17
Totals	$ 132.69	$ 2,840.74

Source: Mumphrey, et al (1978).

TABLE 4.14

Revised Estimate Of Gross Economic Contribution Of A Wetland Acre

In The Barataria Basin Based On U. S. Army Corps Of Engineers Regulations

Activity Category	Annual Return Per Acre	Present Value Per Acre
Commercial Fishing	$ 93.13	$ 1,801.76
Non-Commercial Fishing	3.19	46.40
Commercial Trapping (Pelts & Meats)	3.80	55.30
Recreation		
Economic Impact of Recreation Expenditures	20.58	299.28
Economic Value of User Benefits from Recreation	76.95	1,790.54
Totals	197.65	3,993.28

Source: Mumphrey, et al (1978).

Mitigation Efforts

As mentioned previously much of the environmental damage has been done in the past. Currently, the technology exists to minimize damage to the wetlands. The State of Louisiana has an approved Coastal Zone Management Program which fosters local supervision of many wetland activities. This marks the first time that local governments in our area have participated in, or planned for managing the wetlands resources within their borders. These efforts, combined with U. S. Army Corps of Engineers 404 dredge and fill permit system and the Federal 208 and 201 water pollution control plans of the State should help mitigate future damage to these areas.

Economic factors and regulations also make reclamation a dubious if not impossible proposition. This will help slow down wetland deterioration.

One economic loss to the parish often overlooked is that of the severance tax from wetland oil and gas extraction. Once an area erodes away, the water bottom becomes state owned so that the parish loses its allotment of tax revenues from that former tract of wetlands. By controlling reclamation and channelization of wetlands, the parishes and State can slow down land loss and help preserve a vital source of local revenue.

Stopping Land Loss

Several methods have been proposed for pursuing active policies aimed at slowing or actually stopping land loss. Such methods include the following:

1. allowing the river to resume its natural patterns of flooding and silt deposition
2. controlled introduction of freshwater to combat saltwater intrusion and reintroduce nutrients into the system
3. controlled introduction of water and silt to rebuild subsiding, eroding areas (Gagliano, et al, 1973)

Of course the first alternative is unacceptable, due to the fact that human habitation could not exist here as we know it under these circumstances.

Alternative two is currently being used in St. Bernard Parish and contemplated in Jefferson Parish to reintroduce significant quantities of freshwater back into the ecosystem.

Alternative three is the best, but costliest of the two feasible alternatives. Maintaining a channel depth and flow to more large amounts of silt would be expensive and dangerous to the flood protection system that such a distribution system would have to break.

CONCLUSION

An attempt has been made here in this chapter to condense and present some of the most important conflicts and land use problems in our region. Much has been written about these problems and many have no viable solution at the present time. In Phase II of our Land Use report, we will statistically assess these and other conflicts through a study of land use pattern changes over time. It is hopeful that the reader will gain a better understanding of the issues that confront this area regarding the utilization of our most previous resource, the land we live on.

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